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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

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EDITORIAL OFFICE: Washington, D. C. **P.O. ADDRESS: Box 1736, Washington 13, D. C. Telephone: REpublic 7-6278.

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A. Current Abstracts in English on important meteorological and geoastrophysical literature in every language.

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C. Selective, annotated bibliographies on subjects of immediate and special interest to meteorologists, geophysicists and astrophysicists.

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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

MALCOLM RIGBY, Editor

Vol. 11 MAY 1960 No. 5

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Special Feature in This Issue

Bibliography on Ionospheric Radio Propagation
By
Geza Thuronyi

(For table of contents see back cover)

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SELECT LIST OF PERIODICALS

Note: This list contains the titles of the periodicals which regularly contain material on meteorology or geophysics and it comprises only a small percentage of the periodicals from which pertinent articles are abstracted. The form of serial entry adopted is given in bold face type below.

Acta Geophysica Polonica, [Warsaw].
Acta Meteorologica Sinica, [Peking].
Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. and **Ser. Geofiz.,** [Moscow].
American Geophysical Union, Transactions, [Washington].
American Meteorological Society, Bulletin, [Boston].
Angewandte Meteorologie, [Potsdam].
Annales de Géophysique, Central National de la Recherche Scientifique, [Paris].
Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A and Ser. B, [Vienna].
Australian Journal of Physics, [Melbourne]
Beiträge zur Physik der Atmosphäre, [Frankfurt a. Main].
Ciel et Terre, Société Belge d'Astronomie, Météorologie et Physique du Globe, [Brussels]
Geofisica e Meteorologia, Società Italiana di Geofisica, [Genoa].
Geofisica Pura e Applicata, Istituto Geofisico Italiano, [Milan].
Geophysical Magazine, Japan Meteorological Agency, [Tokyo].
Hemel en Dampkring, [The Hague].
Időjárás, Magyar Meteorológiai Társaság and Országos Meteorológiai Intézet, [Budapest
Indian Journal of Meteorology and Geophysics, [Delhi].
Journal de Mécanique et de Physique de l'Atmosphère, Société Météorologique de Fran
Journal of Atmospheric and Terrestrial Physics, [London].
Journal of Geophysical Research, [Washington].
Journal of Meteorological Research, [Tokyo].
Journal of Meteorology, American Meteorological Society, [Boston].
The Marine Observer, Air Ministry, Meteorological Office, London.
The Meteorological Magazine, Air Ministry, Meteorological Office, London.
Meteorologické Zprávy [Prague].
Meteorological Society of Japan, Journal, [Tokyo].
La Météorologie, Société Météorologique de France, [Paris].
Meteorologiia i Gidrologiia, [Leningrad].
Meteorologische Rundschau, [Berlin].
Monthly Weather Review, U. S. Weather Bureau, Washington, D. C.
Polarforschung, Archiv für Polarforschung, [Kiel].
Przegląd Geofizyczny, [Warsaw].
Revista de Geofísica, Instituto Nacional de Geofisica, [Madrid].
Rivista di Meteorologia Aeronautica, Servizio Meteorologico, [Rome].
Royal Meteorological Society, Quarterly Journal, [London].
South Africa, Weather Bureau, Notos, [Pretoria].
Tellus, Svenska Geofysiska Föreningen, Stockholm.
Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia, [Leningrad].
Weather, Royal Meteorological Society, [London].
Weatherwise, American Meteorological Society, [Boston].
Wetter und Leben, Österreichische Gesellschaft für Meteorologie, [Vienna].
WMO Bulletin, World Meteorological Organization, [Geneva].
Zeitschrift für Meteorologie, Meteorologisches Observatorium, Potsdam.

FOREWORD

Meteorological and Geoastrophysical Abstracts is a monthly publication whose purpose is to bring to the attention of meteorologists, geophysicists and astrophysicists current literature in their field.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a special subject (usually arranged chronologically).

Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
5. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
9. Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

1. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
5. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm
9. Condensation Trails	10. Clim. of N. E. Africa	11. Mountain Met.	Detect.

Vol. III, 1952

1. Clim. of N. W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
5. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
9. Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

1. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc.
5. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
9. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V. 1954

1. Oceanog. Met.	2. Clim. of S. E. Asia	3. Auroral Physics	4. Tropopause
5. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
9. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Vol. VI, 1955

1. Bibliog. of Bibliog.	2. Texts & Monogr. Bibliogs.		3. Storm Surges
4. Ionospheric Prop.	5. Photochem.—Upper Atmos.		6. Cloud Physics
7. Radar Cloud Physics	8–9. Atmos. Nuclei	10. Weather Modification	11. Cooling Power

Vol. VII, 1956

1. Synoptic Met.-Arctic	2. Clim. of Enclosed Spaces	3. Cosmic Rays (–1952)
4. Cosmic Rays (1953–56)	5. Atmos. Radioactivity	6. Inversions
7. Snow Micromet.	8. Snow Micromet. (Suppl.)	9–11. Tropical Cyclones

Vol. VIII, 1957

1. Solar Weather Relations	2. Night Airglow	3. Forecasting Special Elements
4. Forest Micrometeorology	5. Hydromet. Forecasting	6. Numerical Forecast. (Suppl.)
7. Albedo 8. Meteors	9–10. Tropospheric Prop.	11. Medical Meteorology

Vol. IX, 1958

1. Radioastronomy	2. Solar Astrophysics	3. Radioactivity in Atmosphere
4. Waves and Currents	5. Physical Oceanog.	6. Dynamic & Phys. Oceanog.
7. Long Range Forecast.	8. Radar Met. 9. Cosmic Rays	10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks	2. Tornado Forecasting	3. Soil Moisture	4. Sferics
5–6. Ozone	7. Acoustic Waves	8. Evaporation Measurement	
9. Evapotranspiration (–1955)	10. Evapotranspiration (1956–1959)		11. Evaporation

Vol. XI, 1960

1. Outstanding Reference Works	2. Outstanding Texts	3. Numerical Forecast. (Suppl.)
4. Ionospheric Physics	5. Ionospheric Propagation	6. Ionosphere

Other bibliographies in preparation are:

Airglow	*Forecast Verification*	*Radar Meteorology*
Aurora	*High Atmosphere Temperatures*	*Rocket Meteorology*

Part III contains a listing of reviews, translations, reprints, and the contents of important publications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. The December issue comprises cumulative author, subject, geographical and journal indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where th material may be found. The Union List of Serials (Gregory) is the source of most of th symbols used. In some cases, where no symbol has been assigned to a library, one will b devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by chart
Ⓢ	after an abstract indicates an abstract prepared for NASA.

Geographic locations are in the English form rather than the form used locally, for exampl Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwi stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet using a modifica tion of the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months a abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Numb (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus a entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau, Jahrgang* 2 (Vo 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL AND GEOASTROPHYSICAL MATERIAL

A. GENERAL

1. TEXTS, BOOKS AND MONOGRAPHS

See also: **Solar-terrestrial relationships** (de Jager), 11.5–88; **Marine hydrochem.** (Datsko), 11.5–197; **Hydrography, Dutch Wadden Sea** (Postma), 11.5–218; **Hydrologic data summaries, Norway,** 11.5–225.

11.5–1 551.579.5(477)

*Befani, N. F.; Terent'ev, E. V. and Lalykin, N. V., **Issledovaniia vpityvaniia livnevykh vod na iuge Ukrainy i Moldavii (1953/1954 gody).** [Investigation of rainwater infiltration in the Ukraine and in Moldavia during the 1953/1954 period.] *Odessa. Gidrometeorologicheskiĭ Institut, Trudy,* Vol. 9, **1956.** 214 p. Mostly tables. **DLC**—Detailed data from 272 infiltration experiments using artificial sprinkling (showers), conducted in 1953 and 1954 by the Hydrometeorological Service at Odessa and the Dept. of Meteorology and Hydrology of Odessa University. Work in 1953 was conducted at Tudorov, Moldavian S.S.R. on the right bank of the Dniester and in the L'vov-Kherson Region on the right bank of the lower Dnieper. In 1954 the experiments were made on the left bank of the lower Dniester at Maiak in the Belialvsk area of Odessa Region and at Dneprian in the Kherson Region. Work was conducted on slopes to determine rates of infiltration of shower or melt-water. The methods of investigation, construction of the artificial rain apparatus and the infiltrometers (both 1953 and 2 types of 1954 models were used), and the program of observations and methods of tabulation are described. Studies were made in various types of cover, including forest conditions; and of the influence of soil moisture and rate and duration of rainfall, and on soil cultivation, crop types or methods. Shelter belts and their effect on infiltration were also investigated. *Subject Headings:* **1. Infiltration experiments 2. Infiltration data 3. Artificial rain equipment 4. Infiltrometers 5. Odessa Region, U.S.S.R.**—*M.R.*

11.5–2 551.582.1(285:71:73)

*†Langlois, Thomas Huxley (*Dir. Stone Inst. Hydrobiology, Ohio Univ.*), **The western end of Lake Erie and its ecology.** Ann Arbor, Mich., J. W. Edwards, Pub., Inc., **1954.** 479 p. 72 figs., 26 tables, bibliog. p. 422–457. **DLC** (QH98.L3)—In a readable text on the hydrobiology of western Lake Erie, sections on climate (p. 25–33), on wind and waves (p. 34–38), on water masses (p. 39–58), on pollution (p. 59–63), on shoreline processes (p. 63–76) and on winter ice (p. 76–85) follow a section on the geography in Ch. II, which deals with the **Physical environment.** Considerable data are presented in tables and graphs. The remainder of the book is devoted to descriptions of various types of living organisms in the Lake. *Subject Headings:* **1. Climate of Western Lake Erie 2. Limnology 3. Lake Erie, United States.**—*M.R.*

11.5–3 551.586:577.4(26)(02)

*†Moore, Hilary B. (*Marine Lab., Univ. of Miami*), **Marine ecology.** N. Y., Wiley, **1958.** 493 p. numerous figs. and tables, bibliog. p. 429–455. Price: $9.50. **DLC** (QH91.M75). Review by E. F. Thompson in *Geographical Review,* London, 50(1):128–129, Jan. **1960.** Review by Joel W. Hedgpeth in *Science,* Wash., D. C., 129(3344):264–265, Jan. 30, **1959.** Review by H. Brattström in *Deep Sea Research,* N. Y., 6(1):75–76, Oct. **1959.**—Ch. 2 (p. 17–82) deals with the physical environmental factors in marine ecology: 1) temperature, 2) salinity, 3) pressure, 4) illumination, 5) waves, 6) currents, 7) abrasion, 8) substratum and 9) tides; and Ch. 3 (p. 83–99) with chemical factors: 1) oxygen, 2) CO_2. 3) H_2S, 4) pH concentrates, 5) inorganic salts and 6) organic compounds. Temperature and tides are treated in the greatest

detail with numerous graphs and charts of all kinds from many sources. A very detail subject index and a lengthy bibliography is included. *Subject Headings:* **1. Marine ecolo textbooks 2. Marine environment.**—*M.R.*

11.5–4 551.574.1 :0

†Fuks, N. A. (*Academy of Sciences, U.S.S.R.*), **The mechanics of aerosols.** Transl. fr the Russian by E. Lachowicz. *U. S. Chemical Warfare Labs., CWL Special Publication* 4- **1958.** 448 p. 81 figs., 37 tables, 581 refs., eqs. **DWB** (M74.1 F961meE). Transl. original Russian, **Mekhanika Aerozoleĭ.** Moscow, Akademiia Nauk SSSR, **1955.** 351 39 figs., 37 tables, 581 refs., eqs. **DLC** (QD549.F9). (For abstract on original Russian, 9.11–6, Nov. 1958, *MAB.*) *Subject Headings:* **1. Aerosol mechanics 2. Bibliography aerosols. I. Lachowicz, E.** (*transl.*).

11.5–5 551.585.53 :551.584.2 (25

†Pierre, F., **Ecologie et peuplement entomologique des sables vifs du Sahara Nord-Oc dental.** [Ecology and entomological population of shifting sand in the northwestern Sahara *France. Centre National de la Recherche Scientifique. Centre d'Etudes Sahariennes, Public tions, Sér. Biologie,* No. 1, **1958.** 332 p. 140 figs., 16 plates, tables, bibliog.—This work divided in two parts; the former concerns the study of the surroundings, the latter deals wi the study of population. Study of the medium is subdivided in six chapters. The fi chapter is titled **Shifting sand of the northwestern Sahara.** In the second chapter, auth examines the main features of this Saharian region in comparison with certain data relati to the Sudan and North Africa. Attention is drawn to the irregularities of rain. Next, t author compares the climate of the erg (sand-hill) with those of the hamada (stony platea of the wadi and of the palm-plantation for each of the 4 seasons. Climate of the erg is coo and more humid than that of the hamada during spring and summer, warmer in autumn, t same in winter. Climate of the wadi is warmer and more humid than the preceding one spring, summer and winter, but cooler in autumn. In the palm-plantation, climate is alwa cooler and more humid. Ch. 3 deals with endoclimate of sand, showing the opposition existi between the internal climate of sand and that of the surface. Irregularity in distribution rain, depth of penetration and evaporation speed are pointed out. Temperature of san considered from the seasonal point of view and after rain, and relative humidi of the interior of sand are discussed. In Ch. 4, on the microclimates of sand, the auth distinguishes between sand in contact with plants and microclimates of sand within und ground hollows. The important part of the physical and chemical properties of sand on t distribution of sand-dwellers is pointed out in Ch. 5. Study of biotic factors is covered Ch. 6. The study of population is also divided into 6 chapters: 1) entomological fauna sands; 2) morphological peculiarities of sand-dwellers; 3) physiological peculiarities of sa dwellers; 4) ethological peculiarities of sand-dwellers; 5) structure of the groups and 6) ori of sand-dwelling fauna. *Subject Headings:* **1. Mesoclimatology 2. Desert climates 3. Nor western Sahara.**—*A.V.*

11.5–6 551.582.1 (436

*Lauscher, Friedrich et al., **Witterung und Klima von Linz.** [Weather and climate Linz.] *Wetter und Leben,* Sonderheft, Vienna, No. 6, **1959.** 235 p. tables. **DLC**—T special number of *Wetter und Leben* (all articles abstracted separately), which contains detailed account of the climate and weather of Linz, is both of historical and practical intere The continuous weather observations, at first qualitative, and then with the invention instruments, quantitative, not only constitute an interesting chapter in the history of a spec science but they also provide valuable knowledge on the history of weather and climate i given continental locality. In their practical aspect, such detailed weather data are valua in city planning and local climatic studies. The contents of this monograph, which abstracted separately, include the following, viz: Weather chronology of the Linz area; Supp ment 1: The Linz weather observations of JOHANNES KEPLER; Supplement 2: Temperat observations in Linz in 1760; Supplement 3: Specimen of weather tables of K. HASSLIN (1796); The 105-year meteorological observations in Linz from 1852 to 1956; Local clima

and atmospheric chemical investigations in the Linz area; Contributions to a knowledge of the climate of Linz; and practical application. *Subject Headings:* **1. Climate of Linz 2. Linz, Austria.**—*I.L.D.*

11.5–7 551.521.64(02)

†Hooper, John Edward and Scharff, M., **The cosmic radiation.** London, Methuen, N. Y., John Wiley, **1958.** 172 p. 42 figs., tables, 12 refs. Price: 12 sh. 6 d. **DLC** (QC485.H64). Review by A. L. Hodson, in *Science Progress*, London, 47(187):588–589, July **1959.**—Originally a series of lectures, now revised in the form of a book to provide an introduction to the subject of cosmic radiation suitable for students and physicists engaged in other fields. The book is divided into 7 chapters, sketching systematically the properties of the primary radiation, and the development of the radiation in its passage through the atmosphere. The primary radiation which enters the 10% of the upper atmosphere is investigated first, and then, more briefly, the interactions initiated directly and indirectly by these particles. Finally, the degradation of the energy of the primary particles and their secondaries in their passage through the atmosphere is roughly sketched. A short nontechnical list for further reading appears at the end of the book. *Subject Heading:* **1. Cosmic ray textbooks.**—*I.S.*

11.5–8 551.509.33(47)

*Kashin, Kensarin Ivanovich and Pagava, S. T., **Issledovanie znachitel'nykh mesiachnykh anomaliĭ temperatury vozdukha na evropeĭskoĭ territorii SSSR.** [Investigations of the significant monthly anomalies of air temperature over the European U.S.S.R.] Moscow, Gidrometeoizdat., **1959.** 130 p. 41 figs., 26 tables, 2 refs. At head of t-p.: Glavnoe Upravlenie Ministrov SSSR. Tsentral'nyĭ Institut Prognozov. **DLC** (QC903.K24), **DWB** (M24.35 K19is)—An analytical statistical study of the air temp. anomalies over European U.S.S.R. and the current and succeeding circulation types and vice-versa for the next 3 months. The intensity of the disruption of the normal seasonal flow patterns seems to be closely linked with the temp. anomalies during the second month following. Extensive tables of all types are included in addition to mean and anomaly charts for the area. *Subject Headings:* **1. Long range forecasting guide 2. Monthly forecasts for European U.S.S.R. 3. Mean monthly temperature anomalies, European U.S.S.R. 4. European U.S.S.R.**—*M.R.*

2. POPULAR BOOKS

11.5–9 551.594.5

Isaev, Sergeĭ Ivanovich and Pushkov, N. V., **Poliarnye siianiia.** [Auroras.] Illus. by G. N. Gamon-Gamon. Moscow, Akademiia Nauk SSSR, **1958.** 111 p. 50 figs., 14 plates, 5 tables. At head of t-p.: Akademiia Nauk SSSR, Nauchno-Populiarnaia Seriia. **DLC** (QC971.I78)—A popular (25,000 copies) scientific, but very substantial and scholarly, monograph on the aurora in all of its geographic, esthetic and physico-chemical aspects. The 12 separate chapters discuss in concise form, with effective illustrations or graphs (taken mainly from original Soviet sources), the history of study of the aurora, auroral charts, forms and classification, geographic distribution, relation to magnetic storms, to solar phenomena, knowledge of composition and temperature of upper atmosphere from auroral data, radar location of auroras, spectroscopic and photometric studies, theories, effect on radio propagation and, finally, a chapter by G. N. GAMON-GAMON entitled **Moi zarisovki poliarnykh siianiĭ** [My auroral sketches], gives the history of the excellent sketches of 14 auroral displays which are appended. These were made in 1937–38 at Tulom near Murmansk. The present work is mainly devoted to Russian investigations and workers from LOMONOSOV to IGY. *Subject Headings:* **1. Auroral investigations in U.S.S.R. 2. Auroral sketches 3. Radar reflections from auroras 4. U.S.S.R.**—*M.R.*

11.5–10 523.1 113/119

Lovell, Alfred Charles Bernard (*Prof. Radio Astronomy Univ. of Manchester*), **Individual and the universe.** The BBC Reith Lectures 1958. N. Y., Harper, **1959.** 111 p. plates.

DLC (QB51.L62 1959). Review by E. G. R. Taylor in *Institute of Navigation, London, Journa* 12(3/4):260–275, July/Oct. **1959.**—A small, popular exposition of the "new astronomy" an new concepts of the universe, based on a series of 6 lectures broadcast in the fall of 1958 ov the BBC. The nature, history of discoveries, origin of solar system, government subsidi and research, and origin of the universe are reviewed. A number of excellent photographs astronomer's equipment and stars, nebulae, galaxies are included. *Subject Headings:* **1. Co mology 2. Astronomy.**—*M.R.* ⑤

11.5–11 551.510.5:087

Newell, Homer Edward, **Window in the sky: the story of our upper atmosphere.** Illu by Gustav Schrotter. N. Y., McGraw-Hill, **1959.** 116 p. Vita, p.(117). **DLC** (QC879.N4 —A popular or elementary (junior high school level) account, systematically arranged an well indexed, of the upper atmosphere in all of its aspects and according to the latest inform tion. The subjects covered in short chapters include: origin of the atmosphere, nomenclatur density, pressure, temperature, collision frequency and mean free path, composition, cloud winds, turbulence, solar radiation, ionosphere, aurora, airglow, meteors, cosmic rays, and out atmosphere. Technical details such as the D, E, F1, F2, sporadic E layers of the atmospher whistlers, noctilucent clouds, windows in atmosphere, etc. are considered. Simple mathemati and diagrams are used to illustrate or explain phenomena. *Subject Headings:* **1. Upper a mosphere 2. Juvenile meteorology books.**—*M.R.* ⑤

3. MANUALS—ATLASES

See also: **Observers manuals,** 11.5–245.

11.5–12 551.508.26:551.525.4:621.31

Golubev, Aleksandr Vasil'evich, **Distantsionnye izmereniia temperatury, pucheniia napriazheniia termicheski deiatel'nogo sloia grunta.** [Remote measurements of the tem perature, heaving, and stresses in the thermally active soil layer.] Moscow, Akademi Nauk SSSR, **1957.** 83 p. 41 figs., 2 tables, 9 refs., 25 eqs. **DLC** (QC902.G6)—A detaile technical monograph or manual covering the various elements and aspects of a remote recordi soil temperature and permafrost apparatus based on the Wheatstone bridge principle. Calibra tion, accuracy, sensitivity, use in field conditions, discovery and elimination of systemat errors, the thermometric complex, programming device, photo recorder, illuminating devic circuits, evaluation of records, recording of thermal currents, linear and angular systems devices for recording soil heaving, and other frozen soil phenomena are treated with numero line or schematic drawings, photos, charts, records, and tables used by way of illustratio *Subject Headings:* **1. Remote recording soil thermometers 2. Telemetering systems 3. Sc temperature recorders 4. Frost heaving recorders.**—*M.R.*

11.5–13 551.542:551.509.2

*Lahey, James F.; Bryson, Reid A.; Corzine, Harold A. et al., **Atlas of 300 mb wind cha acteristics for the Northern Hemisphere.** Wisconsin. Univ. Dept. of Meteorology, Contra AF 19(604)-2278, Final Report, Pt. 1, **1960.** 1 p. of text. 1 ref. Almost entirely unnumbere charts, 24×60 cm. Also: (for abstract on **Atlas of 500 mb wind characteristics . . .**, *s* 9.9–35, Sept. 1958, *MAB.*) **DWB**—Data for 300 mb heights over the Northern Hemisphe at 1500z for 2912 days during 8 years from Jan. 1, 1950 through Dec. 31, 1957, were used obtain grid point values and to compile this atlas comprising 152 charts (12 maps per mont plus 8 maps giving a harmonic analysis of month-to-month height variations). The 12 ma for each month present resultant monthly geostrophic winds, mean daily west-east and sout north component of geostrophic wind (m.p.s.), respectively. Standard deviation of west-ea and south-north components, mean height in feet, standard deviation of daily height, mea temperature, total momentum flux, steady motion momentum flux, eddy motion momentu flux, and kinetic energy per unit volume are included. *Subject Headings:* **1. Northern Hem sphere pressure charts 2. 300 mb pressure charts 3. 300 mb wind charts 4. Momentu flux charts. I. Hutchins, Charles W. II. Johnson, Welburn K.**—*M.R. and Authors' abstrac*

4. IGY–WMO

See also: **IGY solar program** (d'Azambuja), 11.5–87; **IGY geomagnetic program** (Afanas'eva), 11.5–142; **IGY symposium,** 11.5–185; **IGY vulcanology program** (de Magnée), 11.5–191; **IGY oceanog. program** (Bossolasco), 11.5–199; **WMO Commission on Aerology** (Defrise et al.), 11.5–248; **IGY stations** (Kliukin), 11.5–253; **IGY radiation program** (Mörikofer), 11.5–290.

11.5–14 91.04(99):778.3 551.501.9:551.506.22(99)

Akademiia Nauk SSSR. Kompleksnaia Antarkticheskaia Ekspeditsiia, 1955— **Photomaterials of the Soviet Antarctic Expedition of 1955–1956.** 35 photos with English legends, in binder. **DWB** (919.9 A313ph)—This group of excellent photos shows personnel and activities in the Russian Sector of the Antarctic during establishment of the Mirny, Vostok and Sovetskaya stations. Many of the now famous scientists (e.g., M. M. Sornov (head of expeditions), P. A. Shumskiĭ and others) are mentioned and the unloading of the "Lena," and "Ob," helicopter reconnaissance and transport of men and equipment, surveying and erecting the stations and instrument shelters, releasing radiosondes, etc. are described. *Subject Headings:* **1. Soviet IGY Antarctic stations 2. IGY Antarctic activities 3. Antarctic expedition photographs 4. Mirny, Antarctica.**—*M.R.*

11.5–15 551.506.22:551.501.9(99)

Benes, Norman S., **The Hallett story (Inside Antarctica, No. 4).** *Weatherwise,* Boston, 12(5):200–205, Oct. 1959. 5 photos, ref. **DWB**—An IGY station was established on Jan. 9, 1957 at Cape Hallett on the west side of the Ross Sea by Americans and New Zealanders. The pioneering group consisted of 4 meteorologists headed by James A. Shear of the Univ. of Kentucky. Twice daily upper air and 3-hourly surface observations were made, and hourly surface observations during periods of aircraft activity between New York and McMurdo Sound, as it is a key point in flight planning and navigation. A meteorological tower was erected in 1958 and soil temp. measurements were begun in April 1958. Two years of climatic and one year of microclimatic records are available. Extreme temps. were +42° and −44°F and peak gusts up to 99 kn were recorded. Radiation, albedo, and even balloon-borne radiometer measurements were made. The article discusses weather, climate, ice flying and living conditions, forecasting problems, etc. and is illustrated by excellent photos showing surrounding mountains and terrain, buildings, instrument set-up, radiation equipment and a thermograph trace showing temp. ¼″ above moss (Dec. 1958) reaching 68°F on Dec. 19. The pioneer group was replaced by the author with a new group of assistants in 1958. *Subject Headings:* **1. IGY Antarctic stations 2. Cape Hallett, Ross Sea, Antarctica.**—*M.R.*

11.5–16 551.507.362.2:551.506.22

Finlay, William H. (*Canberra, A. C. T., Australia*), **Launching IGY satellites.** *Institute of Radio Engineers, N. Y., Proceedings,* 46(1):357, Jan. 1958. 2 refs. **DLC**—Report of observations of satellites and the points on earth that are most suitable for the launching and observation of earth satellites. Port Pegasus, Stewart Island, New Zealand (lat. 47°11′S, long. 167°40′E) is considered an accessible and suitable point. *Subject Headings:* **1. IGY satellite program 2. Satellite launching.**—*N.N.*

11.5–17 551.506.22:551.510.7

Machta, Lester W. and List, Robert (*both, U. S. W. B.*), **IGY nuclear radiation investigations.** *American Geophysical Union, Transactions,* 39(4):799–801, Aug. 1958. **DWB, DLC**—Programs of the Atomic Energy Commission, the Public Health Service, the Naval Research Laboratory and the Air Force Cambridge Research Center to investigate and measure the radioactivity of air, of precipitation at the earth's surface, and of solid particles deposited on the ground are summarized. These programs were a result of the recommendations of the Special IGY Committee meeting held in Barcelona in September, 1956. *Subject Headings:* **1. IGY radioactivity program 2. Radioactive fallout research 3. Radioactivity in the atmosphere.**—*N.N.*

11.5–18 550.3:551.506.22:061

Mitra, A. P. (*Sec., Indian National Committee for IGY*), **The International Geophysic Year: 1957–1958: world programme.** *Journal of Scientific and Industrial Research, Ser.* New Delhi, 16(8):327–336, Aug. **1957.** fig. **DWB, DLC**—History and purposes of IG distribution of stations, world days and alerts, general programs in geomagnetism, glaciolog synoptic and dynamic meteorology, physical meteorology (ozone, aurora, airglow, ionospher exosphere, solar terrestrial relations, cosmic rays, meteors), satellites, rockets, Antarctic stud and world data centers are outlined in some detail. *Subject Heading:* **1. IGY program.**—*M.*

11.5–19 551.506.22:551.501

*International Geophysical Year, 1957/1958, **Geographical distribution of the Internationa Geophysical Year stations,** ed. by M. Nicolet and P. Doyen. Its *Annals*, Vol. 8 (IG Instruction Manuals), issued London, Pergamon Press, **1959.** 304 p. Almost entirely table **DWB** (M06.22 I61ann)—An outline of the various areas and disciplines during the IGY described, giving the geomagnetic regions and the geographic coordinates of all the thousan of stations where observations were made. A system of classifying the stations is also ou lined. The two categories of nuclear radiation stations created in 1956 are enumerate *Subject Heading:* **1. IGY networks. I. Nicolet, M.** (*ed.*) **II. Doyen, P.** (*ed.*).—*N.N.*

11.5–20 551.506.2

Nicolet, M. and Baker, F. W. G. (*eds.*), **Membership and programs of the IGY participati committees.** *International Geophysical Year, 1957/1958, Annals*, Vol. 9, **1959.** 305 p. **DW** (M06.22 I61ann)—A list of 67 countries and dates of first participation in IGY shows th increase since the idea first started in 1953 with 22 countries (35 in 1954, 40 in 1955, 50 in 19 and 67 in 1957). The volume gives complete details of IGY committees for each countr and the programs and sub-committees in each of the 14 fields, but not the lists of statio which is published in the *IGY Annals*, Vol. 8. Programs published here are essentially proposed at the beginning of IGY (in June 1957). *Subject Headings:* **1. IGY program 2. IG participating countries.**—*M.R.*

11.5–21 551.506.2

International Geophysical Year, 1957/1958. Special Committee, **CSAGI guide to IG World Data Centres.** 14 sections (each separately paged) and Amendments. Sections date June 7, **1957.** Amendments dated July 10, **1957**–April 2, **1958.** Mimeo. **DWB** (551.0 161cs)—This detailed guide to proposed IGY activities contains listings or descriptions world and national data centers, stations, projects, type of data to be obtained, time schedule publication of data, means of communication, forms to be used, etc., in all 14 disciplines the IGY program. *Subject Heading:* **1. IGY data centers.**—*G.T.*

11.5–22 551.506.22(99

U. S. Joint Publications Research Service, **Arctic and Antarctic: selected translation from Soviet-bloc International Geophysical Year Literature.** Issued as its *JPRS* 651-D (an as U. S. Office of Technical Services OTS 59-11, 505), April 13, **1959.** 25 p. figs., table Price: $0.75 from Office of Technical Services, Wash., D. C. **DWB** (919 U584ar)—Th issue of translated Soviet-bloc IGY literature gives translations of 4 articles on the Antarct and Arctic, published in 1957–58: 1) **Geomorphology of eastern Antarctic** by P. S. Voronov 2) **Magnetic anomalies and disturbances in Antarctic** by A. P. Nikol'skiĭ; 3) **Dry ice clou dispersal in Arctic** by A. I. Voskresenskiĭ et al., and 4) **Tropopause forecasting by empirica influence functions** by Iu. N. Volkonskiĭ. *Subject Headings:* **1. Antarctic IGY literatur 2. Geomagnetism in Antarctic 3. Cloud seeding 4. Tropopause forecasting.**—*M.R.*

5. CONFERENCES—COLLECTED WORKS—SYMPOSIA

See also: **Aeronautical met. conf.,** 11.5–44; **Symposium on IGY,** 11.5–185.

11.5–23 551.577.37:061

*†Australia. Bureau of Meteorology, **Conference on estimation of extreme precipitatio Melbourne, April 22–24, 1958.** Issued Melbourne, Dec. **1958.** 271 p. figs., tables, refs., eq

Contents: Gibbs, W. J., **The rain process,** p. 10–56. Hounam, C. E., **Occurrence of extreme 24 hour rainfall over New South Wales,** p. 57–68. O'Mahony, G., **Estimation of maximum probable precipitation by statistical methods,** p. 69–90. Langford, J. C., **A critical survey of the synoptic limitation of storm transposition,** p. 91–102. Mason, B., **The theory of the "Thunderstorm Model,"** p. 103–126. Moss, J. M., **Preliminary investigation of ocean temperatures and maximum dew points in the New South Wales region,** p. 127–148. Vollprecht, R., **Review of papers published in Australia on the estimation of maximum possible rainfall,** p. 149–190. Brunt, A. T., **Analysis of two Queensland storms (the Crohamhurst storm of 1893 and the Mackay storm of Feb. 1958),** p. 191–244. Walpole, J., **Maximum possible rainfall over Australia,** p. 245–271. (These articles abstracted separately.) **DWB** (77.31 C748c). *Subject Headings:* **1. Maximum possible precipitation 2. Conferences 3. Australia. I. Gibbs, W. J.** (*Chairman*).

11.5–24 551.508.99:061.3

*†Conference on Liquid Scintillation Counting, Northwestern Univ., Aug. 1957, **Liquid scintillation counting: proceedings of the Conference.** Ed. by Carlos G. Bell, Jr. and F. Newton Hayes. Sponsored by the National Foundation and the Technological Institute of Northwestern Univ. London, Pergamon, **1958.** 292 p. figs., plates, tables, refs. throughout. **DLC** (QC787.C6C6 1957). Review by George W. Wetherill in *American Geophysical Union, Transactions,* 49(3):225, Sept. **1959.**—A compendium of 35 articles on principles, sensitivity, instrumentation and applications of liquid scintillation counters (a new field discovered about 1950 and now used in many branches of science for radiation measurements), based on papers read at Northwestern University at the Conference attended by 350 scientists, engineers, etc. Specific applications to archaeology, hydrology and meteorology are found in articles by J. P. Arnold (p. 129–134) and by Dostrovsky et al. on p. 283–287, respectively. The latter article deals with assay of natural tritium from cosmic ray sources or from artificial sources (thermonuclear explosions) in rain or ground water. The age of reservoirs of water in nature (land and ocean) and of the moisture in the atmosphere can be determined by liquid counters using a fractioning column for isotope separations. Sample preparation, counting apparatus and procedure and evaluation of this method compared with the gas counting method (which is one order of magnitude more sensitive). The enrichment method is, however, more accurate than the electrolytic method. Rainfall samples were measured by this method in April 1954 in the U. S. and in water in the Arava Valley between the Dead Sea and Red Sea, and in the Dead Sea at 100 m depth. *Subject Headings:* **1. Scintillation counters 2. Liquid scintillation counter conferences 3. Liquid scintillation counter measurement of tritium 4. Radiocarbon dating 5. Radioactivity of rainwater. I. Bell, Carlos G., Jr.** (*ed.*) **II. Hayes, F. Newton** (*ed.*).—*M.R.*

11.5–25 551.585.7(234.3):061.3

International Congress on Alpine Meteorology, 5th, Garmisch-Partenkirchen, Sept. 14–16, 1958 (**Proceedings**). *Germany. Deutscher Wetterdienst, Berichte,* 8(54), **1959.** 303 p. figs., tables, refs. (For listing of contents, see Pt. III, p. 1774, Nov. 1959, *MAB.* Full length articles abstracted.) **DWB, DLC**—Contains 65 articles presented at the 3-day Conference presided over by G. Bell, arranged under 6 major headings: 1) glacier-meteorology (6 papers), 2) atmospheric electricity (3 papers); 3) biometeorology (12 papers), 4) hydrometeorology (15 papers), 5) Alpine weather (21 papers) and 6) radiation (8 papers). This was the 5th Int. Conf. on Alpine Met.; the first was held at Milan and Turin in 1950, 2d at Obergurgl (Austria) in 1952, the 3rd at Davos in 1954 and the 4th (*see* 9.10–3, Oct. 1958, *MAB*) at Chamonix in 1956. The sessions were moderated by Barbé, Troll, Bossolasco, Siedentopf, Čadež, Berg, Steinhauser, Mügge, Morikofer and Möller. The Slovenian Meteorological Service has invited the Congress to hold its 6th meeting at Bled in Jan. 1960. A list of 214 attendants, a subject index and the exact addresses of the 65 participants are appended. *Subject Headings:* **1. International Congress on Alpine meteorology, 5th, 1958 2. Alpine meteorology conferences 3. Glacier meteorology 4. Biometeorology 5. Garmisch-Partenkirchen, Germany.**—*M.R.*

11.5–26 91:061.3 551.58(08)

*†International Geographical Union, **Proceedings of the IGU Regional Conference, Japan, 1957. Aug. 28–Sept. 8, 1957, Tokyo and Nara.** Pub. by the Organizing Committee of IGU

Regional Conference in Japan, The Science Council of Japan, Tokyo, 1959. 606 p. figs tables, refs. (For listing of pertinent papers, *see* Pt. III, p. 1777, Nov. 1959, *MAB*. Fu length papers abstracted separately.) **DWB** (910.6 I61pr)—A nicely bound and edited volur containing the officers, members, agenda, attendants from 22 countries, transactions, addresse excursions, and the papers read under 3 headings: 1) Physical geography, 2) Human geograph 3) Cartography with remarks, maps and diagrams somewhat abridged. Sixteen papers interest to climatologists are abstracted separately. Two other papers are given in abstra form only in the **Proceedings.** These papers by S. B. CHATTERJEE, GEORGE B. CRESS CHUNG-CHI WANG, TAIJE YAZAWA, MASATOSHI YOSHINO, TAKESHI SEKIGUTI, R. SAITO a others deal with the Indian premonsoon, Asian deserts, Climate of Taiwan, Japan, Ci climates, Meteorological disasters in Japan, Climatic changes in Mongolia, etc. All accon panied by data in tables and graphs. The excursions were numerous and extensive and each described and illustrated and the leaders and participants listed. Extensive classified lis of maps on exhibition at the conference are also included. *Subject Headings:* **1. Internation geographical conferences 2. Climatology symposia 3. Japan.**—*M.R.*

11.5–27 538.12:523.7

†Lehnert, Bo Peter (*ed.*), **Electromagnetic phenomena in cosmical physics.** Cambridg Univ. Press, **1958.** 544 p. bibliogs. Price: 50 sh. (*International Astronomical Unio Symposium*, No. 6, held in Stockholm, Aug. **1956.**) (Pertinent articles abstracted separately **DLC** (QB461.L43)—A collection of 56 articles on magneto-hydrodynamics (theory, experimen and observed behavior of ionized gas in a magnetic field), solar electrodynamics, stellar magne ism, solar and interplanetary magnetic fields, electromagnetic state in interplanetary spa (magnetic storms and cosmic ray behavior), high current discharges and radio astronomy, et read at the 6th International Astronomical Union Symposium held in Stockholm, Aug. 2 1956, under the general chairmanship of H. ALFVÉN. Articles include discussions. *Subje Headings:* **1. Magneto-hydrodynamics conferences 2. Astrophysics conferences 3. Sol electrodynamics 4. Auroras 5. Cosmic rays.**—*M.R.*

11.5–28 551.5:550.3:061

Gaevskaia, G. N., **Konferentsiia molodnykh spetsialistov Glavnoĭ geofizicheskoĭ ob servatorii im. A. I. Voeĭkova.** [Conference of junior specialists of the A. I. Voeĭkov Ma Geophysical Observatory.] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:61, Feb. **195 DWB, DLC**—This conference of junior specialists was held on Oct. 28–29, 1957. The pape presented by various members of the University of Leningrad, Arctic Research Institut included the following subjects: Problem of the horizontal exchange in the atmosphere; po sibility of persistence forecasting of monthly temperature anomalies; calculation of snow mel derivation of a formula for calculating heat exchange of a snow surface with the atmosphe on the basis of the Prandtl relationship and the stage law of Laĭkhtman; radiation; ligh scattering, etc. The names of individuals presenting papers are listed. *Subject Heading* **1. Geophysical conferences 2. Meteorological conferences 3. Leningrad, U.S.S.R.**—*I.L.*

6. EDUCATION, HISTORY, BIOGRAPHY, ETC.

HISTORY

See also: **Hist. of met. optics** (Ho), **11.5–324.**

11.5–29 551.5:378.4(74

Moss, John H. (*Franklin & Marshall College, Lancaster, Pa.*), **Meteorology in the ne Pennsylvania high school earth and space science courses.** *Weatherwise*, Boston, 12(5):18 190, Oct. **1959.** photo. **DWB**—Meteorology is being included in the new Earth and Spa science course (at 30 high schools) provided by the Pennsylvania Dept. of Public Instructi on the initiative of CHARLES H. BOEHM, Supt. of Public Instruction. The course was writt by a committee of 14 scientists and teachers under LEE BOYER of the Bureau of Curriculu Services, with ROBERT N. FORD of Millersville State Teachers College and FRANCES K. DAV

of Drexel Institute. The course is to be equivalent to those in physics, chemistry or biology and will be offered for gifted students at first. A 111 page guide was organized consisting of 5 sections, one of which is meteorology which comprises 9–12 weeks and includes setting up and monitoring a local weather station. One of the major problems is training teachers. Over 60 Pennsylvania schools purchased equipment. *Subject Headings:* **1. Teaching of meteorology in high schools 2. Pennsylvania.**—*M.R.*

11.5–30 551.5:378(43-15)

†Voigts, Heinrich, **Die Meteorologie in den höheren Schulen.** [Meteorology in the higher schools.] *Meteorologische Rundschau,* 11(1):19–22, Jan./Feb. **1958.** table, 86 refs. **DWB, DLC**—This paper is a detailed examination of the manner in which meteorology is treated in textbooks of physics and geography, and the place of meteorology in the teaching programs of the secondary schools of Germany. The names of nonmeteorological journals containing papers on meteorological subjects or instruction in meteorology are cited, together with the titles of various outstanding papers. The new teaching program on geography, issued by the West German Ministry of Instruction, the statements on the teaching of geography and meteorology issued by UNESCO and the IGU, etc. are summarized. Recent physics and geography textbooks for secondary schools are mentioned and their treatment of meteorology is evaluated. Finally, atlases, maps and various aids in meteorology teaching are cited and described. *Subject Headings:* **1. Teaching of meteorology in high schools 2. Western Germany.**—*I.L.D.*

11.5–31 551.5:92 551.5:378.18

Schaefer, Vincent J., **The boy who learned to grow salt.** *Saturday Review, N. Y.,* 42(50): 51-55, Dec. 12, **1959.** Also Johathan, Will: **The man who taught the boy: Vincent J. Schaefer (Personality portrait, 45),** *Ibid.,* p. 54–55. **DLC**—A vivid account of the discovery made by one of the students at VINCENT SCHAEFER'S summer training course in meteorology for high school students, conducted by the American Met. Society, in 1959 at the Loomis School in Windsor, Conn. which involved growing fibrous crystals (whiskers) from an inorganic salt, and developing a successful technique which the author himself had never been able to accomplish. The whiskers were formed of sodium chloride by putting a saturated solution in a Frankfurter skin. They grow to $\frac{3}{4}''$ lengths, and appeared in bundles which could be teased out into parallel solid crystal spikes. Even better ones ($\frac{1}{2}''$ long) were made of sodium bromide. These were single crystals of unvarying thickness. The similarity of these crystals to columnar frost which forms in swampy areas is pointed out. Questions remaining unanswered and possible uses of this (and of other information discovered by 80% of the 30 projects undertaken by students at this course) are outlined. Finally, a biography of V. J. SCHAEFER, the author and leader of this project, is included. *Subject Headings:* **1. Summer meteorological course—Windsor, Conn. 2. Atmospheric sciences program 3. Salt whiskers 4. Crystal growth 5. Biography of V. J. Schaefer 6. Schaefer, V. J.**—*M.R.*

11.5–32 551.5:378.18

Schaefer, Vincent J. (*Res. Consultant and Academic Director, 1959 Atmospheric Sci. Program*), **An adventure in atmospheric science.** *Weatherwise,* Boston, 12(5):183–186, Oct. **1959.** 2 photos. **DWB**—A lucid description of the experiment conducted by the A.M.S. with help from the N.S.F. at the Loomis School in Windsor, Conn. Thirty high school students selected from 205 applicants and coming from 15 states and England participated in the Atmospheric Sciences Program which lasted for 7 weeks, and stressed basic research. The students had finished the junior year and had had a chance to see the need for a broad training in physics, chemistry and mathematics. The program included college type lectures on basic physics, physics lab. course, lab. and field projects in atmospheric science, and study and library work. No consideration was given to previous interest in meteorology. The projects were all of practical importance. Certificates were given at end of course and special recognition for original work or progress. Abstracts of 31 projects are included in article. *Subject Headings:* **1. Summer meteorological course—Windsor, Conn. 2. Atmospheric sciences program.**—*M.R.*

Biography

See also: **Biog. of V. J. Schaefer, 11.5–31.**

11.5–33 551.5:551.46:92

Bergeron, Tor, **The young Carl-Gustaf Rossby.** (In: Bolin, Bert, (*ed.*), **The atmosphere and the sea in motion.** N. Y., Rockefeller Institute Press, **1959.** p. 51–55. photo.) Also: Byers, Horace R., **Carl-Gustaf Rossby, the organizer.** *Ibid.*, p. 56–59. Also: **Publications by Carl-Gustaf Rossby.** *Ibid.*, p. 60–64. **DLC**—The biographical sketch of C.-G. Rossby by Tor Bergeron goes into his family background and childhood influences, his education and the influence of V. Bjerknes, his development in the U. S., and his major contribution to the present and future of our science. Horace Byers makes a detailed analysis of Rossby's activities and influence in the U. S., at M. I. T., Chicago, the World War II effort and, finally, the International Institute in Stockholm. The list of publications of Rossby began with an article in *Ymer* in 1923 and includes 69 works through 1957. *Subject Headings:* **1. Biography of C.-G. Rossby 2. Bibliography of C.-G. Rossby 3. Rossby, C.-G.**—*M.R.*

11.5–34 551.5:92

Presentation of the Cullum Geographical Medal to Charles Warren Thornthwaite. *Geographical Review*, N. Y., 49(2):238–239, April **1959.** photo. **DWB, DLC**—At the annual dinner for Fellows (300 attended) of the American Geographical Society in New York on Jan. 20, 1959, the gold Cullum Geographical Medal was awarded to C. W. Thornthwaite by Walter A. Wood, President of the Society. Admiral Peary was the first to receive this medal (in 1896). The citation, which is quoted, gives a brief summary of Thornthwaite's career, activities and contributions in the fields of climatology, ecology and geography, and his 11 years as director of the Climatic and Physiographic Division of the Soil Conservation Service and (since 1948) of the Laboratory of Climatology in Centerton, N. J. *Subject Headings:* **1. Cullum Geographical Medal Award 2. Thornthwaite, C. W.**—*M.R.*

11.5–35 551.5:922

Delone, B. N., **Vydaiushchiisia ital'ianskiĭ fizik i matematik (k 350-letiiu so dnia rozhdeniia Evandzhelista Torrichelli).** [The eminent Italian physicist and mathematician, Evangelista Torricelli: the 350th anniversary of his birth.] *Priroda*, Moscow, No. 2:77–80, Feb. **1959.** photo. **DLC**—A brief account is given of the life and scientific achievements of Torricelli against the background of the scientific activity of Galileo and his successors. The history of experiments to determine the pressure of the atmosphere and the final development of the mercury barometer and of the formula $v = \sqrt{2gh}$ to determine the velocity of outflow of fluid from a vessel, derived by Torricelli, are presented. His contributions to mathematics are summarized. These included the development of the method of primes, the formula of the integral of a power with any rational index, similarity of the integral with infinite limits, solution of the problem of tangents to curves, the examination of the ratio $y\,dk/x\,dn$, development of the theory of quadratures, etc. *Subject Headings:* **1. Biography of E. Torricelli 2. Torricelli, E.**—*I.L.D.*

11.5–36 551.521.1:620.91:92

Spaulding, James C., **Our sunlit statesman; Prof. Farrington Daniels.** *Saturday Review*, N. Y., 42(14):66–67, April **1959.** port. **DLC**—A biographical sketch of the man who represented the U. S. at the World Congress on Applied Solar Energy in Delhi in 1955, together with some technological and scientific facts about the availability of solar energy and many applications. *Subject Headings:* **1. Biography of Farrington Daniels 2. Daniels, Farrington 3. Solar energy utilization.**—*M.R.*

Glossaries and Bibliography

See also: **Bibliog. of C.-G. Rossby (Bergeron), 11.5–33.**

11.5–37 551.5(03) 532.5(03)

Noveck, Sonia, **Russian-English glossary of physics of fluids and meteorology.** N. Y., Interlanguage Dictionaries Pub. Corp., **1959.** 93 p. Price: $10.00. **DLC** (QC145.N6)—

A miscellaneous collection of Russian terms in hydrodynamics, aerodynamics, meteorology, oceanography, etc. gleaned from the *Doklady, Izvestiia, JETP* and *Astronomicheskiĭ Zhurnal*, and their English equivalents. It contains about 4000 terms and although far from complete, there are a large number of new or recent terms not found in other similar glossaries, and the terms in dynamic meteorology are quite voluminous. *Subject Headings:* **1. Russian-English meteorological glossaries 2. Russian-English hydrodynamics glossaries.**—*M.R.*

11.5–38 551.582.3(549):016

†Grimes, Annie E. (*comp.*), **Selected bibliography of climatic maps for Pakistan.** Wash., D. C., U. S. Weather Bureau, July **1959.** 8 p. 27 titles with annotations. **DWB** (M(016) U587sep)—Arranged alphabetically by author. No index. Mostly from U. S. W. B. Library —a few from the Library of Congress Map Division. *Subject Headings:* **1. Bibliography on climatic charts of Pakistan 2. Climate charts of Pakistan 3. Pakistan.**—*M.R.*

B. APPLICATIONS

1. AERONAUTICS

11.5–39 551.574.7:551.576.11

Knowler, A. E. (*Ministry of Supply, London*), **Ice on aircraft.** *Shell Aviation News*, London, Paris, No. 245:14–17, Nov. **1958.** fig., 4 photos. **DWB**—Three forms of icing on aircraft are explained: glaze, rime and frost crystals. The frequency of encounters with cloud and icing conditions is shown in a graph. For icing research it is desirable to measure continuously and directly the rate at which ice is formed and the water content of clouds. Several methods and instruments developed or used at the Royal Aircraft Establishment, Farnborough, are described as well as aerodynamic research in a wind tunnel. Sensitive icing detectors are developed which indicate when the water concentration in the air is $\geqslant 0.1$ gram per cubic meter. *Subject Headings:* **1. Icing of aircraft 2. Cloud structure 3. Icing instruments.**—*A.V.*

11.5–40 629.13:551.574.7

La lutte contre la buée et le givre sur les parebrise d'avions. [Prevention of mist and ice on aircraft windows.] *Shell Aviation News*, Paris, London, No. 243:19–20, Aug. **1958.** 2 figs. **DWB**—Statement of the principles of classical processes used to prevent vapor and rime on aircraft windows: double screens, hot air, thawing fluids and electrical heating. Two methods, based on the principle of electrical heating, have been perfected by the Triplex Safety Glass Co., Ltd. One uses a fine net of resistance wires and the other a gold transparent conducting film. The author describes the system of electrical heating for each of these methods, he explains its functioning and comments on the results obtained. The powers required for de-icing or dissipation of vapor are in the same range for both the systems. When power exceeds 1000 watt/m^2, it is necessary to use a thermostatic regulator in order to prevent the overheating of the screens. Description and functioning of the regulating device are included. *Subject Headings:* **1. Ice prevention on aircraft windows 2. Icing of aircraft.**—*A.V.*

11.5–41 551.574.7:629.13(541)

Srinivasan, V. (*Met. Office, Calcutta*), **Meteorological aspects of ice accretion over Assam air routes.** *Indian Journal of Meteorology and Geophysics*, Delhi, 10(2):169–172, April **1959.** table, ref. **DWB, DLC**—The debriefing reports for 1954–56 received from Dakota aircraft in respect of ice accretion on Assam air routes have been studied in conjunction with synoptic charts and aerological data. A study of the freezing level on these routes, which is intimately connected with icing conditions has also been made. *Subject Headings:* **1. Icing of aircraft 2. Ice accretion 3. Assam, India.**—*Author's abstract.*

11.5–42 551.506.7:551.507.352

*Murgatroyd, R. J. (*Meteorological Research Flight, Royal Aircraft Establishment, Farnborough*), **Mesures météorologiques effectuées a bord d'un avion à réaction.** [Meteorological measurements in jet aircraft.] *Shell Aviation News*, Paris, London, No. 244:7–11, Oct. **1958.** 5 figs. **DWB**—The author emphasizes the importance of meteorological conditions prevailing

in the upper atmosphere for jet aircraft flights. Not only temperature, wind, height of tropopause, position and intensity of jet streams and turbulence, but also the clouds in the stratosphere, the solar and terrestrial radiation and ozone are all important elements. Difficulties involved in measuring temperature, wind and humidity at high altitudes are examined; attention is drawn to the importance of the accuracy of measurements and to the various instruments used to make these measurements. *Subject Headings:* **1. Upper air observation 2. Jet aircraft instrumentation.**—*A.V.*

11.5–43 551.5:629.13:6

Sorenson, J. E. and Balzer, M. E., **Weather in airline profit planning.** *United Air Lines, Inc., Meteorology Circular*, No. 44, Dec. 1, **1957.** Pt. 1, Sorenson, J. E.: **Effect of upper wind patterns on long range aircraft operations.** 5 p. 9 figs. Pt. 2, Balzer, M. E.: **Eighteen months of storm avoidance with airborne radar.** 4 p. 3 figs. **DWB**—An attempt to show economic value of adequate upper air wind forecasts for selecting optimum transcontinental flying levels and of storm avoidance radar to actual airlines operations during a specific period. During Jan. 1957 it was shown that $92,600 and in Feb. $50,900 in time/fuel savings were achieved on 30 DC-7 flights of U.A.L. using accepted $400 per hour cost basis; total savings $143,500. In the case of weather radar it is shown that a reduction in static discharges, unusual events, turbulence incidents, turbulence delays and length of turbulence incidents for every million miles flown, has been achieved. This is reflected in passenger safety, comfort and schedule reliability. *Subject Headings:* **1. Aeronautical meteorology 2. Industrial meteorology 3. Weather effects on airline economy 4. United Air Lines 5. United States.**—*M.R.*

11.5–44 551.5:629.13:061.3

Meteorology in relation to high level aviation in India and neighbourhood—Consultative Conference and Symposium. *Indian Journal of Meteorology and Geophysics*, New Delhi, 9(1):72–73, Jan. **1958. DWB, DLC**—A brief report of the Meteorological Consultative Conference of the principal aviation interests in India held on Dec. 6, 1957. The agenda items which included various matters of operational importance (landing forecasts, wind data for take-off, runway visual range, slant visibility, etc.) are listed. This conference was followed by a Technical Symposium on Meteorology in Relation to High Level Aviation over India and Surrounding Areas held on Dec. 7, 1957. The 16 papers delivered covered such topics as the effect of temperature, air density and humidity in relation to operation of turbine powered aircraft, forecasting of clear air turbulence, fluctuations in ozone content, etc. *Subject Headings:* **1. Aeronautical meteorology conferences 2. High altitude flying 3. India. I. India. Meteorological Dept.**—*I.L.D.*

2. AGRICULTURE

See also: **Rainfall erosion index** (Wischmeier), 11.5–310; **Agroclimatic regions, Ukraine** (Sapozhnikova), **11.5–319.**

11.5–45 551.586:633.41:632.4:632.9

Bernard, J., **Les avertissements agricoles et la lutte contre la cercosporiose.** [Agricultural warnings and action against cercosporiosis.] *Phytoma*, Paris, 11(108):15–19, May **1959.** 3 figs. **CU, DA**—Techniques used against beet fungi (*cercosporiosis*) at French warning stations consist essentially in: 1) following evolution of the disease from its appearance up to beginning of dangerous stage; 2) observing evolution of climatic factors in the regions under consideration so as to be able to forecast the rain that causes scattering and germination of spores; 3) recommending, with regard to presumed seriousness of meteorological conditions, the application of a fungus-destroying treatment within the five days following the contaminating rain. *Subject Headings:* **1. Agricultural meteorology 2. Climatic effects on beet disease 3. Beet disease.**—*A.V.*

11.5–46 551.586:633.491:632.111

†Hawkes, J. G. (*Birmingham Univ., England*), **Significance of wild species and primitive forms for potato breeding.** *Euphytica*, Wageningen, 7(3):257–270, Oct. **1958.** 2 figs., 28 refs.

English, German and Dutch summaries. **DA, CU**—Three stages in the history of the utilization of wild potatoes are outlined, and it is suggested that we are now entering on a fourth stage, typified by fuller international co-operation than has hitherto been possible. The availability of useful genes is considered in the light of our knowledge of the cross-breeding and evolutionary relationships of potato species. Breeding mechanisms in species at various levels of ploidy are shown to play an important part in speciation, and the significant role of a sexual reproduction in potatoes is discussed. The geographical localization of most genes carrying resistance to *Phytophthora*, viruses, *Heterodera*, *Leptinotarsa* and frost is discussed. Certain explanations to account for this localization are advanced. *Subject Headings:* **1. Potato breeding 2. Phytophthora resistant potatoes 3. Frost resistant potatoes.**—*A. V.*

11.5–47 551.586:634.38(521.71)

Kashiwakura, H., **Forecasting of the date of germination and development of mulberry leaves in Tsu, West Japan.** *Journal of Meteorological Research*, Tokyo, 10(3):234–236, March **1958.** 5 figs., 5 tables. In Japanese. **DWB, DLC**—In order to improve the silkworm industry, the correlation between meteorological factors and the influence of such factors upon the date of germination and development of mulberry leaves, particularly on the molting bract and on the 6th unfolding leaf, was studied for the period of 1937–1956. The author tabulated the result of germination and mean air temperature on the same date; molting bract commenced at 7°C air temperature 1.5 m above earth's surface with differences of 3 days earlier and later; the period of molting bract to the 6th unfolding leaf is influenced more by air temperature than by rainfall amount and sunshine. Author concludes that unless unusual weather occurs, mulberry growth, after reaching the 6th unfolding leaf, will continue because of its biological capacity. *Subject Headings:* **1. Minimum temperature effects on mulberry leaves 2. Mulberry leaf development 3. Tsu, Japan.**—*K.C.*

11.5–48 551.577.32:551.579:633.51(669)

Manning, H. L., **Crop-water relations of cotton at Samaru.** (In: West African Cotton Research Conference, Samaru, Northern Nigeria, Nov. 18–23, 1957, **Proceedings,** issued **1959.** p. 181–192. 4 figs., 4 tables, 13 refs. Issued by the Ministry of Agriculture, Samaru, and printed by Gaskiya Corporation, Northern Nigeria.)—Low cotton yields from northern Nigeria have been attributed to water-logging, low nutrient status and insect pest or plant disease complexes. An abrupt change from wet to arid conditions, associated with the harmattan is also recognized as an important factor. Peak rainfall occurs during the latter part of August. At this period the presence of standing water in furrows has been adduced as evidence of water-logging. However, the improvement in infiltration and percolation by grass mulch soil surface treatments, indicates that complete saturation of the soil is unlikely except with exceptional seasonal rainfall. This paper shows that for seasons beginning in June, rainfall is likely to be adequate to meet optimum crop water requirements. For the season beginning in July, at least once in four years the seasonal total is likely to be insufficient, and for the August season, the seasonal total will be inadequate in most years. Moreover, in all instances, the calculations were based on no surface runoff of rainfall. The pattern of crop water requirement has been based on data from Uganda. The assessment specific to Nigerian conditions must clearly be carried out. This work raises the question of more effective use of increased soil moisture, which is discussed in relation to spacing trials, sowing data trials and conclusions from previous fertilizer trials. At the higher yield levels envisaged, the control of insect pests and plant diseases may be worth further investigation. *Subject Headings:* **1. Cotton culture 2. Climatic influences on cotton culture 3. Seasonal rainfall 4. Soil moisture and runoff 5. Northern Nigeria.**—*Author's abstract.*

11.5–49 551.521.17/18:631.544 551.586:63

Nisen, A., **Contribution à l'étude des propriétés des matériaux de recouvrement des constructions horticoles et des conséquences de leur utilisation. Rôle physiologique des diverses radiations.** [Contribution to the study of roofing materials in horticultural engineering and consequences of their use. Physiological role of the various types of radiation.] *Gembloux. Institut Agronomique de l'Etat, Bulletin de l'Institut et des Stations de Recherches,* 27(2):222–256, **1959,** and 27(3):257–353, **1959.** 33 figs., tables, 5 refs., eqs. **LU, Or CA**—In

Ch. I of this study, which is a dissertation for a doctorate, the author investigates the biologic role of U.V., infrared and visible radiation on plants and the influence of visible radiation photosynthesis. Relationships between visible radiation and growth are considered, a more particularly the action of visible radiation on generative development (photoperiodism morphogenesis and coloring of organs. This study has made it possible to determine t following optimum properties offered by glass roofing of greenhouses as concerns transparen to the 0.3 to 3.5μ radiations: a) amount of incident light (visible radiation) reduced as little possible; b) no unfavorable alteration of the emission spectra of the sun; c) adequate tra parency to short infrared and at the same time opaqueness to long infrared (5 to 35μ and mo re-emitted by soil and plants. Ch. 2 to 8 concern, respectively: passage of light through gla transmission spectrum of materials, refractive index of materials, scattering materials, tra parency of colored materials, heat, temperature under screen (greenhouses, beds, etc.) a forecasting these temperatures; cooling speed within a definite area, statement of results some cultural trials, influence of humidity upon losses of light through absorption and reflectio *Subject Headings:* **1. Greenhouse research 2. Biological effects of radiation on plants 3. H midity effects on light absorption.**—*A. V.*

11.5–50 551.586:636.6(584.

Koniukhov, N. A., **Zoometeorologicheskie usloviia provedeniia peregona i strizhki ove v oseniĭ period.** [Zoometeorological conditions for pasturing and shearing sheep in the fall *Alma-Ata, Kazakhstan. Kazakhskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ I stitut, Trudy*, 8:47–56, **1957.** fig., 6 tables, 2 refs. **DWB**—Since the fall weather conditio constitute a fundamental factor determining the date on which sheep are driven to upla pastures and the dates of fall shearing in Kazakhstan, the author establishes the characteristi of weather conditions that are either favorable or unfavorable for these operations. T method for determining the favorable weather conditions, under which the sheep can overco the most difficult parts of the route, and the unfavorable conditions which may arise after t drive and which will determine when the fall shearing dates are established, are describe It involves route observations of the various weather elements and determining the temper ture, precipitation and wind conditions unfavorable for sheep 20–30 days after shearin especially during shearing and 7–11 days afterwards. With the aid of data collected over period of years, the author discusses the relationship of dates of unfavorable cold weather date of passage of daily mean temperature through 5°C, dates of beginning of periods with co unfavorable weather, probability of beginning of fall cold, etc. *Subject Headings:* **1. Weath effects on sheep 2. Animal bioclimatology 3. Sheep breeding 4. Kazakh S.S.R.**—*I.L.D.*

11.5–51 551.521.1:551.586:636.6(584.

Koniukhov, N. A. and Chekeres, A. I., **O solnechnoĭ radiatsii kak zooklimatichesko faktore.** [Solar radiation as a zooclimatic factor.] *Alma-Ata, Kazakhstan. Kazakhsk Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, 8:100–104, **1957.** fig., 6 ref **DWB**—The authors present a series of observations from which it is possible to judge indirect the effect of solar radiation upon the condition and behavior of sheep. It was found that bright sunny days heat losses are compensated to a considerable degree by absorption of radia energy. On the basis of numerous observations made on spring and fall-winter pastures a on clear and cloudy days, the combinations of temperature and humidity of comfortable a uncomfortable days for shorn sheep were determined and shown on a graph. On lowla pastures at sea level clear bright days with weak winds become uncomfortable at 25°C. At a elevation of 2200–2500 m bright days with low winds become uncomfortably hot for sheep 17–18°C and above. A radiation increase of 20% produces the same effect in the heat conditi of sheep as a 7% increase in air temperature or by 28%. *Subject Headings:* **1. Solar radiati effects on animals 2. Animal bioclimatology 3. Sheep breeding 4. Kazakh S.S.R.**—*I.L.*

11.5–52 551.586:612.014.43:6

*†Lee, D. H. K., **Studies of heat regulation in the sheep, with special reference to t Merino.** *Australian Journal of Agricultural Research*, 1(2):200–216, April **1950.** 2 figs 4 tables, 26 refs. **DLC**—Results of 10 yrs of laboratory, field and literature study of the he regulation of warm blooded animals, especially with application to sheep. Thermodynam

r heat exchange due to metabolism; solar, sky and ground radiation; conduction and convection (respiratory and cutaneous); evaporation-convection (respiratory and cutaneous and pplied water); heat storage, heat regulation mechanisms; skin temperature, reduced activity, old weather regulation, dehydration, disturbances in acid-base balance, reproductive failure; esults of body temperature rise, heat tolerance, humidity, air movement; cold effects, acclimatzation to cold, breed differences, etc., are discussed with inclusion of graphical and tabular ata obtained under direction of the author. Comparison is made with other animals. *Subject Headings:* **1. Thermal balance of sheep 2. Heat loss from sheep.**—*M.R.*

11.5–53 551.586:612.014.43:636

†Priestley, C. H. B., **Heat balance of sheep standing in the sun.** *Australian Journal of Agricultural Research*, 8(3):271–280, **1957.** 2 figs., 2 tables, eqs. **DLC.** Also issued as reprint by Commonwealth Scientific and Industrial Research Organization (of) Australia.—An extension is made of Lee's (1950) original discussion of the heat balance of sheep exposed to a tropical sun. Methods are given for calculating the two quantities, convective heat loss and long wave radiation exchange, which automatically compensate to a large extent for the added heat load. There appear to be advantages in distinguishing between the heat balance of the fleece and that of the body of the sheep, and this provides a method of estimating the heat conducted to the body as a consequence of the insolation. *Subject Headings:* **1. Thermal balance of sheep 2. Heat loss from sheep.**—*Author's abstract.*

11.5–54 551.586:551.524.36/.37:634.25

†Mota, Fernando Silveira da, **A cultura do pessegueiro e o clima de Pelotas: principais problemas e possiveis soluções.** [Peach cultivation and the Pelotas climate: main problems and solutions.] *Pelotas, Rio Grande do Sul. Institute Agronomico do Sul, Circular*, No. 6, Dec. **1956.** 18 p. fig., photos, tables, 53 refs. **DWB**—Influence of winter cold and frost (temperatures <7°C, 0°C, −1°C and −4°C during July–October) on various varieties of peach crops in the Rio Grande do Sul region of Brazil are considered in this study. Lack of sustained cold may be as harmful as severe frost. Some data are included in tables and graphs. *Subject Headings:* **1. Climatic effects on peach crop 2. Frost frequencies in Rio Grande do Sul, Brazil 3. Cold effects on peaches 4. Pelotas, Rio Grande do Sul, Brazil.**—*M.R.*

3. FORESTRY AND FIRE WEATHER

11.5–55 582.47:662.998

Bouvarel, P. and Lemoine, M., **La conservation par le froid des graines de résineux.** [The cold storage of conifer seeds.] *Revue Forestière Française*, Nancy, No. 7:493–497, July **1958.**—The results of experiments made at the French Forest Research Station prove that cold storage of seeds of resinous trees prolongs their life and they can be planted as much as a year later. The seed must be placed in cold storage immediately after harvest. Temperature must remain as constant as possible, between +2°C and +4°C. The seeds must be gathered very dry: water content from 9 to 11% for the greatest part of conifer seeds. *Subject Headings:* **1. Conifer seeds 2. Cold storage effects on seeds 3. Nancy, France.**—*A.V.*

11.5–56 551.5:614.84

Fushiki, Japan. Weather Station, **On a fire at Watari-Machi, Takaoka-Shi.** *Journal of Meteorological Research*, Tokyo, 7(2):115–116, March **1955.** 5 tables, fig. In Japanese. **DWB**—Charts show location of area in town which was devastated by fire. Tables give winds from 8 directions for 12 periods and other data. *Subject Headings:* **1. City fires 2. Fire weather 3. Takaoka, Japan.**—*M.R.*

11.5–57 551.524.36:582.47:547.45

†Parker, Johnson, **Seasonal variations in sugars of conifers with some observations on cold resistance.** *Forest Science*, Wash., D. C., 5(1):56–63, March **1959.** fig., 3 tables, 17 refs. **DWB**—This report describes the results of determinations of the various sugars in leaves, bark and other parts of an eastern white pine tree at different times of the year. It reports on low temperature resistance as determined for some of these conifers in the cold and warm

seasons. *Subject Headings:* 1. Low temperature effects on pines 2. Sugar content of conifer —*N.N.*

11.5–58 551.588.6:634.

Rostlund, Erhard, **Potential productivity of the world's forests.** *Geographical Revie* N. Y., 49(2):273–275, April 1959. eq., refs. in text. **DWB, DLC**—A discussion of seve studies of forest productivity which have been published in the U. S., Germany and Swed 1954–1958, including a Doctoral dissertation by STEN STURE PATERSON, entitled **Forest ar of the world and its potential productivity** submitted to K. Univ. of Göteborg, 1956 (11.1–300, Jan. 1960, *MAB*), wherein an empirical formula for estimating forest productivi (CVP Index) from temperature, rainfall and radiation (based on data from 41 stations Scandinavia), is set forth. This Climate-Vegetation-Productivity Index: $I = \frac{Tv \cdot P \cdot G}{Ta \cdot 12.1}$ wherein Tv = the average temperature of the warmest month (°C), Ta = the annual temperatu range; P = the annual precipitation (mm); G = the number of months in the growing seaso E = radiation factor according to MILANKOVITCH. A map of the world based on 1400 statio (also presented) and the conclusions obtained therefrom are criticized. *Subject Heading* **1. CVP Index for world 2. Forest-climate relationships 3. Forest productivity.**—*M.R.*

4. MEDICINE AND HEALTH

See also: **Satellite biophysics** (Mayo), 11.5–182.

11.5–59 551.524.36:551.586:551.585.53:6

*†Baker, Paul T., **A theoretical model for desert heat tolerance.** *U. S. Quartermas Research and Engineering Center. Environmental protection Research Div., Technical Rep* EP-96, July 1958. 20 p. 5 figs., table, 37 refs. **DWB** (M86 U585t)—A study of heat loss under desert conditions reveals that body characteristics, sweat glands, vasodilation, sk color and genetic differences make a difference in adaptation to extremes of heat such as a found in desert environments. The theoretical model conforms very well to the actual dese populations who have become genetically adapted. The model is suggested for use in selecti groups of men for desert assignment. Data on sweating of various types of men show co siderable variation and there are actual individual variations of as much as 100% between m tested. *Subject Headings:* **1. Desert heat tolerance 2. Acclimatization.**—*M.R.*

11.5–60 551.524.36:551.586:6

Bobrov, N. I., **Kontrastnye temperatury i ikh vliianie na organizm.** [Contrasting te perature levels and their effect on the body.] *Gigiena i Sanitariia*, Moscow, 23(12):26–3 Dec. 1958. 7 refs. English summary p. 31. **DLC**—The author has studied the adaptabili of the human body to the prolonged action of contrasting temperature levels. The solvi of this problem was necessary for the study of the process of acclimatization in regions wi sharp changes of the outside temperature. The results of the investigation carried out on m have shown that the action of contrasting temperatures and repeated cooling produces gradual adaptation of the body to these procedures. The adaptation may be considered completed when the gas exchange increases, the changes in the sensory and motor chrona disappear and there is a decrease in the fall of the skin temperature of the exposed parts of t body. The author considers it possible to use contrasting temperature procedures for i proving the resistance of the organism for prophylactic purposes in regions with unstab temperature regimen. *Subject Headings:* **1. Temperature effects on physiology 2. Acclima ization 3. Extreme temperatures.**—*Author's abstract.*

11.5–61 551.586:612.014

Brunt, David (*Prof. Met., Imperial College of Science and Tech., London*), **Climate a human comfort.** *Royal Institution of Great Britain, London, Proceedings*, 33(151), 194 3 figs. Abstracted from reprint (14 p.). **DWB** (M86:612 B911cL), **DLC** (Q41.R8)— popular-science lecture on what is known about bodily reactions to heat and cold, the limits heat stroke conditions, acclimatization, the effect of ventilation, the classification of climat

the ideal climate and, finally, the history of weather-proof housing in England. Limits of heat are: body temp. 107°F, saturated air at 85°F, 7 or 8 min at air temp. 240°–260°F. Optimum temp. values prescribed in U. S. are 76°F in summer and 72°F in winter; in England 66°F in summer and 62°–64°F in winter. The ideal climate should have mean temperature 60°–70°F. New Zealand fits this criterion. Graphs show limits of range of tolerable conditions for various degrees of activity, effect of ventilation in heat-stroke and a classification of climates on the basis of temp. and humidity. *Subject Headings:* **1. Climate and human comfort 2. Comfort climate classification.**—*M.R.*

11.5–62 551.555.3:612:616.24

†Halhuber, M. J. (*Innsbruck*), **Zur Klinik der sogenannten Föhnbeschwerden.** [Clinical aspects of health complaints due to föhn.] *Annalen der Meteorologie, Medizin-Meteorologische Hefte*, No. 13:112–116, **1958.** 22 refs. **DWB**—A critical review of the literature dealing with the problem of föhn disease with particular reference to the föhn complaints and aggravations of exciting illnesses reported in the northern Alps. The author cites the classical psychophysical föhn symptoms reported by HELLPACH and concludes that föhn symptoms are similar to general weather sensitivity symptoms and also that föhn plays the role of scapegoat for all manner of physical and psychic indispositions. The results of a series of detailed experiments on weather reactions of tubercular patients (*Helv. Physiol. Acta*, 11, C18, C20, **1953**) showed that days with föhn or with warm front passages resulted in the greatest number of weather complaints. Finally, the so-called föhn effects manifested by various diseases and the problem of föhn therapy are considered. The author concludes that föhn complaints exist but there is no specific föhn disease. *Subject Headings:* **1. Föhn sickness 2. Föhn effects on tuberculosis.** —*I.L.D.*

11.5–63 551.586:616:312.226

Marinov, V. K. and Nikolaev, Igor, **Kŭm vŭprosa za patologichnoto vŭzdeĭstvie na vremeto vŭrkhu choveshkiia organizŭm.** [Pathological effect of weather upon the human organism.] *Khidrologiia i Meteorologiia*, Sofia, No. 1:77–84, **1959.** 5 tables, 7 refs. Russian and English summaries p. 83. **DLC**—The article presents the general results of the investigation of the influence of weather on the total mortality in Bulgaria in 1955, the influence of weather on death from cerebral apoplexy and from myocardial infarct for the same year. Biologically unfavorable weather comprises days during which there is a passage of warm, cold or occluded front. An increase in total mortality as well as in death from cerebral apoplexy and myocardial infarct is observed during biologically unfavorable weather. The relation is shown to be on a statistically significant level. *Subject Headings:* **1. Mortality due to weather 2. Weather effects on myocardial infarction 3. Bulgaria.**—*From Authors' abstract.*

11.5–64 551.586:61:001.4

Medizin-Meteorologie. [Medical meteorology.] *Meteorologische Rundschau*, Berlin, 11(3):101, May/June **1958. DWB, DLC**—On May 13 and 14, 1957 the directors of the Medical Meteorological Advisory Offices of the German Weather Service held a conference at Offenbach at which the proper definition of the concept "medical meteorology" was considered. The use of the term medical climatology contravenes the practice of the WMO which considers meteorology to be an all inclusive concept, climatology thus being a subdivision of meteorology. Biometeorology and bioclimatology are unsuitable since these embrace other living organisms in addition to man. The term "medical meteorology" was retained and considered a border field between meteorology (both weather and climate) and medicine. It is pointed out that human beings are not only subject to weather but also to climatic influences and that medical meteorology will best achieve its ends as a result of the mutual cooperation of medical practitioners and meteorologists, each responsible for his own specialty. *Subject Headings:* **1. Medical meteorology 2. Definitions.**—*I.L.D.*

11.5–65 551.586:612

Nicolas, J. P. (*Senegal, Fr. West Africa*), **La notion de complexes et de seuils en bioclimatologie humaine.** [The concept of complexes and thresholds in human bioclimatology.]

International Journal of Bioclimatology and Biometeorology, Leiden, Vol. 1 (Pt. 4, Huma Bioclimatology), **1957.** 4 p. table, 3 refs.—The point of view is presented that climate shoul be studied only as a function of a living being or of a group. The manner of understandi the totality of interacting elements of the biosphere involves the examination of the individu at the center of the biosphere. The basic principles in human climatology are the concep of homothermy and the regulation of water metabolism. The use of temperature and wat vapor content of the atmosphere and cooling power in order to establish a scale for classifyin a locality climatically with reference to its effect on man is discussed. The establishment of sensible climate based upon complexes involving the variables of temperature, water vapo and cooling power and thresholds of sensible climate is based upon the scales involving therma groups, hygrometric types, and cooling mode. The scales of these elements are presente *Subject Heading:* **1. Human bioclimatology.**—*I.L.D.*

11.5–66 551.586:616.519.2

Sŭbev, L., **Vŭrkhu izpolzuvaneto na niakoi statisticheski metodi v biometeorologiiata** [On the use of certain statistical methods in biometeorology.] *Khidrologiia i Meteorologiia* Sofia, No. 4:78–85, **1958.** 5 refs., 2 eqs. Russian and English summaries p. 84–85. **DLC**— The author discusses the method by which B. DE RUDDER determines the statistical significanc of the distribution of diseases, and he proposes his own formula for determining such signif cance. He also critically reviews H. FLADUNG'S method for studying the connection betwee sudden death from heart failure and weather. *Subject Headings:* **1. Statistical methods i biometeorology 2. Weather effects on heart disease.**—*Based on author's abstract.*

11.5–67 551.521.17:616.921.

Tischer, Ilse, **Über die Wirkung des UV Lichtes auf das Hämagglutinationsvermöge von Influenza-Virus.** [On the influence of UV-light on the hemagglutinin capacity of in fluenza virus]. *Die Naturwissenschaften*, Berlin, 46(4):150–152, Feb. **1959.** fig., 3 refs **DLC**—The author describes the instruments and method used for the experiments. Th degree of hemagglutination capacity has been determined by the photometric method of J. DRESCHER according to the relation between light extinction and virus concentration. Com ments are given on the behavior of the hemagglutination action during the different experi ments. *Subject Headings:* **1. Ultraviolet light 2. Hemagglutination capacity of influenza viru 3. Photometric methods 4. Light extinction and virus concentration.**—*A.V.*

11.5–68 551.586:61(09

Undt, W. and Wyklicky, H. (*Austria*), **Ueber bioklimatologische Arbeiten aus der Zei Gerhard Van Swietens in Wien.** [Bioclimatic research during the time of Gerhard Van Swieten in Vienna.] *International Journal of Bioclimatology and Biometeorology*, Leiden Vol. 1 (Pt. 4, Human Bioclimatology), **1957.** 3 p. **DWB**—Truly scientific bioclimatology when observations take the place of speculation, may be said to begin with the appearance o **Observationes barometrico-meteorologicae et epidemicae Anni MDCC** by FRIEDRICH HOFF MANN (1660–1742). He showed the importance of exact observations on wind and weather in relation to disease. The status of medical climatology at the time of GERHARD VAN SWIE TENS (1700–1772) is discussed. In his book **Constitutiones epidemicae et potissimum lugdun Batavorum observati . . .,** VAN SWIETENS summarizes MAXIMILIAN STOLL'S (1742–1787) concepts on the relation between weather and disease. The first instrumental observations o meteorological elements began in Florence in 1654. In Vienna they go back to 1669–1690 Regular observations began in 1734. Complete records are available for the period 1775– 1852, and from 1852 onward the meteorological data are those of Central Observatory of the Meteorological and Magnetic Service established in 1851. *Subject Headings:* **1. Medica climatology 2. Weather effects on diseases 3. History of medical meteorology.**—*I.L.D.*

11.5–69 551.586:59:612.014.43

Weiner, J. S. (*Great Britain*), **Acclimatization in man and animals with references to hormonal adjustments.** *International Journal of Bioclimatology and Biometeorology*, Leiden, Netherlands, Vol. 2 (Pt. 4), **1958.** 3 p. 16 refs. **DWB**—An experiment carried out to

determine whether "natural acclimatization" produced by residence in the tropics is identical with "artificial acclimatization" produced in the laboratory, is described. It is concluded from the experiments that the superior ability to withstand hot environments by tropical residents involves physiological, as well as behavioral adaptation and that the physiological basis of "natural acclimatization" is identical with that of artificial acclimatization produced in the laboratory. Actually the tropical group secreted more sweat, their rectal temperature rose less and their pulse rates and mean skin temperatures were lower. There was no significant difference in the rectal temperatures between the two groups. Hybrid mice reared from 3 to 8 weeks of age at 32°C D.B. and 29.5°C W.B. survived longer at 41°C D.B. and 29.5°C W.B. (heat shocked) than litter mates reared at 21°C D.B. and 16°C W.B. (control reared). The endocrine system is involved in the adjustment of men and animals to high temperatures. Antidiuretic hormone release is increased so as to conserve water in hot environments. There is no significant change in the excretion of 17-hydroxycorticoids, cortise and cortisol or of tetrahydrocortisone and tetrahydrocortisol under hot condition but the output of aldosterone increased considerably. A depression in thyroid activity is indicated by reduced ^{131}I uptake in mice exposed to hot temperatures. *Subject Headings:* **1. Acclimatization 2. Physiological climatology 3. Heat tolerance.**—*I.L.D.*

11.5–70 551.586:612.014.43

West African Council for Medical Research, Lagos, Nigeria, **Hot climate physiological research unit (Biochemistry Department).** "p. 28–40 of the Annual Report for 1956." figs., tables. Mimeo. **DWB** (M86:612 W522re)—Physiological observations were made in April 1956 by W. S. S. LADELL on sweating, pulse rate, body temperature and metabolism of 93 West African workers in the open tin mines under varying temperature, shade and activity (pick and shovel work or driving tractors). Sweat losses varied from 3865 g/day to 673 g/day. *Subject Headings:* **1. Heat effects on man 2. Physiological climatology 3. West Africa. I. Ladell, W. S. S.**—*M.R.*

5. INDUSTRY

11.5–71 551.583.13:551.577.32:637.22

*†Mitchell, W. D., **Iodine value and softening point and churning temperature of some Queensland butterfats.** *Queensland Journal of Agricultural Science*, Brisbane, 16(1):31–48, March 1959. 5 figs., 6 tables, 20 refs. **NNA, DA**—Butterfat production in Queensland shows marked seasonal trends, with maximum production in late summer (Jan.–March), due to the greater proportion of annual rainfall during summer. The investigation reported in this paper was undertaken to determine iodine values and softening points (°C) of butterfat in the different regions of Queensland throughout the year, because of their possible influence on cream churning temperatures. Butter samples were obtained fortnightly during 1954, 1955 and 1956 from 12 centers, representative of the varying climatic conditions throughout Queensland. The degree of variation within years and between years was determined and reported in graphs and tables. Marked seasonal variations were found for both values: the iodine value ranged from 31.7 in Jan.–March to 42.5 in July–August, whereas the softening point ranged from 31.0°C in August–Sept. to 36.4°C in Dec.–May. The possible causes of these variations are discussed. *Subject Headings:* **1. Seasonal influence on butterfat production 2. Churning temperatures 3. Iodine values and softening points of butterfat.**—*A.V.*

11.5–72 551.571:664.72

Soenen, M. M. and Schuchewytsch, G. L., **Considération sur le dosage de l'humidité dans les produits de meunerie.** [Consideration on the amount of moisture in milling products.] *Agricultura*, Louvain, 7(1):107–119, March 1959. fig., 9 tables. French, English and Dutch summaries p. 119. **DA**—The authors have selected a moisture test that can be used as a reference for comparing the results obtained by those generally used in wheat milling. The reference test is a desiccation method in a vacuum at 40°C in the presence of a very strong desiccant such as P_2O_5 until a constant weight is obtained. They concluded that the accuracy of the method is obtained by loss of time, and they precised the conditions of reproductibility of the various tested methods. *Subject Headings:* **1. Wheat milling 2. Humidity techniques determination.**—*A.V. and Authors' abstract.*

6. ARTIFICIAL RADIOACTIVITY

See also: **IGY radioactivity program** (Machta, List), 11.5–17; **Nuclear explosion effects on weather** (Frith), 11.5–283.

11.5–73 551.510.721:551.510.5

*Machta, L. and List, R. J. (*both, U. S. W. B., Wash., D. C.*), **Analysis of stratospher Strontium 90 measurements.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1267–127 Sept. **1959.** 6 figs., 4 tables, 17 refs. **DLC**—The detonation of large thermonuclear devic injects radioactive fission products into the stratosphere, which may remain there for montl or years. Balloon-borne air filters were used to sample the stratosphere at altitudes fro 50,000 to over 90,000 ft. The Sr^{90} data are shown and compared with estimates of the amou injected into the stratosphere. Limitations of the data are discussed. Several meteorologic models suggested to explain the observed data are evaluated. *Subject Headings:* **1. Therm nuclear explosion effects 2. Strontium^{90} stratospheric storage.**—*Authors' abstract.*

11.5–74 551.510.721:551.577

Mageru, V.; Blănariu, D. and Gabe, I., **Über die Verteilung der Aktivität im radioaktive Rückstand aus atmosphärischen Niederschlägen.** [On the distribution of radioactivity i the deposition products from atmospheric precipitation.] *Die Naturwissenschaften*, Berli 46(19):553, Oct. 15, **1959. DLC**—Measurements made in Iasy since 1958 indicate that i many cases (but not in every case) a few very active particles are responsible of the long-live radioactivity of deposits from atmospheric precipitation as indicated by several other author *Subject Headings:* **1. Radioactive fallout 2. Radioactive precipitation.**—*A. V.*

11.5–75 551.510.72

Martell, E. A., **Artificial radioactivity from nuclear tests up to November 1958.** *U. S Air Force Cambridge Research Center, GRD Research Notes*, No. 19, Sept. **1959.** 15 p. 2 figs 2 tables, 13 refs. **DWB**—The production of fission products, carbon-14 and tritium in a U. S., U. K., and Soviet nuclear tests up to the end of 1958 is summarized and discusse Major features of the atmospheric-mixing history and world-wide distribution of fallout ar outlined. Some major differences between U. S. and Soviet tests are pointed out. Nuclea tracer experiments which will contribute to better understanding of atmospheric circulatio and fallout are briefly described. *Subject Headings:* **1. Radioactive fallout global distributio 2. Radioactive tracers in meteorology.**—*Author's abstract.*

11.5–76 551.510.721:699.8

Panero, Robert B. (*Guy B. Panero Engineers, N. Y. C.*), **Minimum design standards fo radiation fallout shelters.** *Air Conditioning, Heating and Ventilating*, N. Y., 56(10):70–75 Oct. **1959.** 4 figs. (incl. photos). **DWB, DLC**—A previous article dealt with the selectio of services for underground shelters. These shelters were designed to provide blast protection as well as fallout protection, for targets of an enemy nuclear attack. Just what constitute target area is indeterminate; target area depends on time period, enemy capability, an strategy. It could conceivably represent deliberate radiation fallout over a large portio of the U. S. The Special Projects Staff of Guy B. Panero Engineers has developed a serie of shelters, designed to protect against fallout, yet sparing the expense of full blast protection A report on these shelters, prepared for the Office of Civil and Defense Mobilization, Battl Creek, Mich., is summarized. The contents do not necessarily reflect OCDM policy on thi subject. *Subject Heading:* **1. Radioactive fallout shelters.**—*Author's abstract.*

11.5–77 551.510.721:662.2:539.

Potter, Thomas D., **Probability of fallout from multiple nuclear detonations.** *U. S. Ai Weather Center. Climatic Center, Technical Memorandum to the Director*, TM-59-3, Aug. 27 **1959.** 6 p. figs., 7 refs., 12 eqs. **DWB** (M10.721 P869pr)—A method for finding the prob ability of fallout occurrence at a given site from two, three or more nuclear detonations wit varying yields is presented. It is assumed that the actual winds have a circular norma distribution, and that the stretch vector correlation coefficient is valid. The calculation i

imple for 2 targets, but for 4 detonations 15 operations must be carried out and for 9 detonations 511 operations. Dosage or dose rate is not considered. A graphical example is given. *Subject Heading:* **1. Fallout probability predictions.**—*M. R.*

C. ASTRONOMY AND ASTROPHYSICS

1. ASTRONOMY

11.5–78 52:061.3 551.5:001.5

Coulomb, J., **Les progrès récents de l'astronomie.** [Recent strides in astronomy.] *L'Astronomie*, Paris, 73(7/8):310–318, July/Aug. **1959. DLC**—Survey and comments relating to the progress in astronomy for the year 1958/59. Author reviews successively the results reported at the 10th General Meeting of the International Union for Astronomy at Moscow; those of the International Geophysical Year; those regarding artificial satellites, planets, sun, stellar evolution and galaxies. Author mentions the discovery, made by the French expeditions, of the resonance line of lithium in the Antarctic twilight spectrum and the detection, thanks to satellites, of the existence all around the earth of two regions where the penetrating radiations have an intensity a thousand times stronger than it was expected from cosmic radiation. This discovery should modify completely previously held ideas about the relationships between solar and terrestrial phenomena. Author also notes the putting into service of the 193 cm telescope, the biggest in Europe, at Haute Provence Observatory and reports that the assembling of the large radiotelescope and original receivers was carried on at the radioastronomical station at Nançay. *Subject Headings:* **1. Astronomical research 2. Van Allen belt 3. International Union for Astronomy meetings 4. International Geophysical Year, 1957–1958 5. Antarctic twilight lithium spectrum 6. Radioastronomical station, Nançay, France.**—*A. V.* Ⓢ

11.5–79 523.77

Pecker, J. C., **La détermination de la composition chimique des étoiles et du soleil.** [The determination of the chemical composition of the stars and the sun.] *L'Astronomie, Paris*, 72(3):93–111, March **1958.** 4 figs., 5 refs. **DLC**—In his introduction, the author recalls the importance of classical astrophysics which consists of the extensive study of the radiation of heavenly bodies observed through the atmosphere, in the wave lengths corresponding almost with the visual field. He recalls the physics data which it is necessary to be acquainted with for the analysis of a stellar spectrum, and then explains the method of the growth curves, as well as the results obtained through this method. It is remarkable that chemical abundances could be measured, that differences could be found from one star to another, and that quantitative interpretation could be suggested in a reasonable manner. *Subject Headings:* **1. Astrophysics 2. Chemical composition of the stars and the sun 3. Growth-curve method.** —*A. V.*

11.5–80 551.508.25:621.396.8:535.417

Malinge, Anne-Marie; Blum, Emile-Jacques; Ginat, Michel and Parise, Marcel, **La branche Nord-Sud du grand interféromètre de la Station de Nançay.** [The north-south arm of the large interferometer at Nançay Station.] *Académie des Sciences, Paris, Comptes Rendus*, 249(20):2009–2011, Nov. 16, **1959.** 2 figs., 15 refs. **DWB, DLC**—Review of the results obtained from observations made with the east-west arm of the large interferometer at Nançay. Improvement of accuracy of these observations requires the use of an interferometer set in the north-south direction. The fundamental parts of this instrument are described, and its principal characteristics are given. It is well adapted to detailed studies relating to the sun and is used for daily observations paired with those made by means of the east-west arm for localizing solar emission sources. *Subject Headings:* **1. Solar radio interferometers 2. Radioastronomical station, Nançay, France.**—*A. V.*

11.5–81 535.417

Barchewitz, M. and Gautier, M., **Systèmes filtrants à couches multiples utilisés en infrarouge.** [Multiple layer filters used in the infrared.] *L'Onde Electrique*, Paris, 39(392):845–

853, Nov. 1959. 14 figs., 11 refs. **DLC**—After reviewing the main characteristics of interfe ence type filters, the authors demonstrate the analogy which exists between these and electr filters and experimental results are given. The calculation of multiple layer filters is di cussed and the application of various types of interference filters to infrared technique indicated. *Subject Heading:* **1. Interference filters.**—*Authors' abstract.*

2. SOLAR PHYSICS

See also: **Solar radiation brightness** (Hardie, Giclas), 11.5–108; **Solar eclipses** (d'Anglejan-Chatillon, Dauvillier), 11.5–112; **Solar influences on cosmic radiation** (Fréon et al.), 11.5–120; **Chromospheric eruption data,** 11.5–149; **Solar activity** (Avignon, Pick), 11.5–153; **Solar flare phenomena** (Dodson), 11.5–157; **Solar radio radiation** (Kraus), 11.5–158; **Solar emissions** (Laffineur), 11.5–159; **Solar temp.** (Whitehurst, Mitchell), 11.5–163; **IGY eclipse exped.** (Friedman), 11.5–175; **Sunspot effects on weather** (Visser), 11.5–323.

11.5–82 521.

Andrillat, H. (*Observatory at Lyons*), **La parallaxe solaire.** [Solar parallax.] *L'A tronomie*, Paris, 73(4):173–180, April **1959.** 6 figs. **DLC**—Account of various methods f measuring solar parallax: direct measurement of parallax, method based on the passages Venus, indirect measurements and determination of solar parallax by means of the aberratio constant. Results obtained with these various methods show that it is not yet possible to g the accurate value of the solar parallax, which ranges about 8″.80. Distance of the sun ca only be estimated at about 170,000 km. *Subject Heading:* **1. Solar parallax measuremen techniques.**—*A. V.* Ⓢ

11.5–83 551.521.6

Bennett, Willard H. (*U. S. Naval Res. Lab., Wash., D. C.*), **Solar proton stream forms wit a laboratory model.** *Review of Scientific Instruments*, N. Y., 30(2):63–69, Feb. **1959.** 9 figs 8 refs. **DWB, DLC**—A laboratory tube has been developed which produces scale models of th forms assumed by streams of charged particles in the earth's dipole magnetic field. Th forms are unexpectedly intricate and complicated, as are also the contacts on the earth' surface. Photographs of some representative stream forms and contacts are presented. Th tube has served as an analog computer for stream forms and contacts and, in addition, ha revealed the importance of the generation of ring currents of charged particles scattered int Störmer's periodic orbits. The same techniques can be applied in studies of stream forms i high-energy accelerators and in other complicated kinds of magnetic fields. *Subject Headings* **1. Solar proton stream models 2. Geomagnetic laboratory techniques.**—*Author's abstract.* Ⓢ

11.5–84 551.521.67:621.396.8:523.7

Boischot, A.; Lee, R. H. and Warwick, J. W., **Low-frequency solar bursts and noise storms.** *Astrophysical Journal*, Chicago, 131(1):61–67, Jan. **1960.** 6 figs., 10 refs., 3 eqs **DWB, DLC**—We report observations of fast-drift, or type III, bursts in the frequency range 15–38 Mc/s. Such bursts account for most of the solar emission observed in this spectra range. While fast-drift bursts last only a few seconds at metric wave lengths, they may persist for half a minute or more in the decametric region and show only a relatively smal variation in frequency with time. A physical interpretation of the duration of the burst suggests that they occur in a region of steep temperature gradient. Their breadth in fre quency indicates excitation by quasirelativistic particles leaving the sun. At intervals o several weeks we also observe steady noise sources, generally persisting for several days. The spectrum of these sources is a continuum, crossed occasionally by a few bursts and ionospheric scintillations. The sources often show discontinuous variations in position from day to day. On one occasion, June 3, 1959, a source moved with a velocity of the order of 850 km/s. *Subject Headings:* **1. Solar bursts 2. Solar noise storms.**—*Authors' abstract.* Ⓢ

11.5–85 523.74

Chvojkova, E., **Ein Problem der Sonnentätigkeit.** [A solar activity problem.] *Die Sterne*, Leipzig, 35(5/6):112–113, May/June **1959.** fig., 2 refs. **DLC**—The distribution o

sunspots is statistically studied for the solar cycles 12 to 17 and the asymmetry between their surfaces on the Northern and Southern and the Eastern and Western Hemispheres is shown by a figure. *Subject Headings:* **1. Solar activity 2. Sunspots distribution.**—*A. V.* Ⓢ

11.5–86 523.75

d'Azambuja, Marguerite, **La chromosphère du soleil.** [The sun's chromosphere.] *L'Astronomie, Paris,* 73(5):205–210, May **1959.** 2 figs. **DLC**—Concise and chronological statement of the principal methods for observing the chromosphere and summary of our present knowledge regarding spectroscopy of the chromosphere. Description of the prominences and short account relating to their forming and evolution. *Subject Headings:* **1. Chromosphere 2. Solar prominences.**—*A. V.* Ⓢ

11.5–87 522.6:551.506.22

d'Azambuja, L., **L'observation du soleil et l'Année Géophysique.** [Observation of the sun and the Geophysical Year.] *L'Astronomie, Paris,* 73(7/8):289–296, July/Aug. **1959.** fig., 3 refs. **DLC**—Survey of research and discoveries made during the International Geophysical Year as regards observation of the sun. Author examines principally the processes of optical solar observation perfected during the Geophysical Year: Lyot's polarizing filters, diffraction gratings, self-acting sun-recorder, spectrohelioscopes, radiotelescope, interferometers. Stress is laid on the international co-operation of the various world-stations, on the wireless and teleprinter-network interconnecting all the observation stations, and on the rapid diffusion of the "ursigrammes." *Subject Headings:* **1. Solar observation techniques 2. IGY solar program.**—*A. V.* Ⓢ

11.5–88 523.72 551.590.21

*†de Jager, Cornelis, **Structure and dynamics of the solar atmosphere.** *Handbuch der Physik,* Berlin, 52:80–362, **1959.** 136 figs., 20 tables, numerous refs., 107 eqs. **DWB**—A major digest of the knowledge up to 1958 of the sun's atmosphere, structure, dynamics and effects on the earth's atmosphere, with ample illustrations, photographs, diagrams, charts, tables, references by the hundreds, etc. The review systematically covers the undisturbed photosphere (granulation, temp. and density variation, turbulence and connection), the chromosphere (limb, disk and transition to corona), the disturbed parts (sunspots, faculae, flares, filaments, prominences), the corona (optical and radio observations), the solar rotation and, finally, the effects on the earth's atmosphere, ionosphere, and weather. *Subject Headings:* **1. Solar atmosphere 2. Solar-terrestrial relationships.**—*M. R.* Ⓢ

11.5–89 523.74

Dodson, Helen W. and Hedeman, E. Ruth (*both, McMath-Hulbert Obs., Univ. Michigan*), **Survey of number of solar flares observed during the International Geophysical Year.** *Journal of Geophysical Research,* Wash., D. C., 65(1):123–131, Jan. **1960.** 7 figs., 4 tables. **DWB, DLC**—According to the McMath-Hulbert Observatory working list of worldwide flares there were more than 6700 solar events during the IGY for which at least one observer estimated the importance to be $\geqslant 1$. According to reports to World Data Centers the flare patrol was gratifyingly complete and uniform. However, examination of the starting times of the reported flares reveals evidence for a serious lack of homogeneity in the IGY flare data. Approximately twice as many flares, $\geqslant 1$, were reported per hour from 05 h to 16 h UT as during the remainder of the Universal Day. This strong dependence on UT exists in the flare data for each month of the IGY. Examination of the patrol hours and flare reports for May and July 1958 for each of the 19 H α cinematographic patrol stations shows that the principal photographic patrol stations fail to confirm the very high rate of flare occurrence for 05 h to 16 h UT that appears in the total IGY data. Visual observations between 05 h and 16 h UT, apparently constitute the principal source of inhomogeneity in the flare data. For the hours 17 to 04 in the Universal Day the IGY flare reports are based primarily on the cinematographic patrol. Comparison of the number of flares and subflares indicates that in the IGY data for the hours 05 h to 16 h UT many flare events are listed as flares that probably would have been classified as subflares by the principal cinematographic observers. *Subject Headings:* **1. Solar flare data 2. IGY solar program.**—*Authors' abstract.* Ⓢ

11.5–90 523.7

Dollfus, Audouin, **Observation de la couronne solaire à l'Observatoire de Meudon** **1959.** [Observation of the solar corona at Meudon Observatory in 1959.] *Académie d Sciences, Paris, Comptes Rendus*, 249 (22):2273–2275, Nov. 30, **1959.** 3 figs., 5 refs. **DW DLC**—A new instrument at Meudon Observatory (Paris) makes it possible to detect the sol corona without a coronograph from an observatory in flat country. Measurements are mad not by means of the monochromatic emissions of the corona according to the usual techniqu of the coronograph, but directly from the white light itself when it appears during eclipse This instrument measures the polarization of the light scattered through the electrons in th corona. This modification of the observation technique increases considerably the number observation days. This new observation method is sensitive up to 10′ from the edge. Auth summarizes the results of the first measurements made in 1958 and relating to photometry the low corona, photometry of higher regions, study of the brilliant structures and study the high large jets. *Subject Headings:* **1. Sun's coronale missions 2. Photometer observa tion of coronas 3. Meudon Observatory, Paris.**—*A.V.* Ⓢ

11.5–91 523.7

Dunn, Richard B. (*Geophys. Res. Direct., Sunspot, N. Mex.*), **Solar limb darkening nea λ6563 from 0.9 to 1.00*R*.** *Astrophysical Journal*, Chicago, 130(3):972–984, Nov. **1959.** 1 figs., 2 tables, 13 refs., 3 eqs. **DWB, DLC**—A curve of solar limb darkening from 0.9 to 1.0 radius has been obtained in the continuum near Hα. The observation has been corrected fo the instrumental profile of a point distribution of light. *Subject Heading:* **1. Solar lim darkening.**—*Author's abstract.* Ⓢ

11.5–92 523.74

Gleissberg, Wolfgang, **Die Zyklen der Sonnentätigkeit.** [Cycles of solar activity. *Akademie der Wissenschaften, Berlin, Wissenschaftliche Annalen*, 6(11):735–745, Nov. **1957** 5 figs., 9 refs. **DWB, DLC**—Sunspots are only one element of the manifested solar activit which also includes photospheric flares in the photosphere as filaments, protuberances, chrom spheric flares and eruptions in the chromosphere and as regions of intensified line emission i the corona. Sunspots, because they are easily observed, are used as an index of solar activit and of its rhythm. The author reviews briefly the history of sunspot studies, the character istics of the 11-year sunspot cycle, the distribution of sunspots over the sun's surface, the mean minimum and maximum outbreaks of sunspots, the eight year cycle in the intensity of out breaks of solar activity, evidence for the existence of cycles of solar activity involving severa hundred years, and theories on the origin of sunspot cycles, (V. Bjerknes and Alfvén) an the nature of the present sunspot cycle. *Subject Headings:* **1. Sunspot cycles 2. Sola activity.**—*I.L.D.*

11.5–93 523.7

†Goldberg, Leo and Pierce, A. Keith, **The photosphere of the sun.** *Handbuch der Physik* Berlin, 52:1–79, **1959.** 27 figs., 12 tables, refs., 39 eqs. **DWB**—A major review of the lates knowledge and data on the continuous spectrum of the sun's photosphere (solar constant limb darkening, solar energy distribution, and observational models of the photosphere) and on the Fraunhofer spectrum (data, origin and analysis). A large number of foot refs. an 16 good annotated general references are included. The text is understandable to the non specialist, but highly condensed and not lacking in theory, especially where the various model are described. *Subject Headings:* **1. Solar photosphere 2. Solar spectra.**—*M.R.* Ⓢ

11.5–94 523.7

Kopecký, Miloslav, **Periodicita a předpovědi výskytu slunečních skvrn.** [Periodicity an prediction of sunspot occurrence.] *Meteorologické Zprávy*, Prague, 9(4):108–112, **1956** 2 figs., table, 5 refs., 11 eqs. **DWB**—The 11-, 22-, and 80-year periodicities of solar activity are discussed and methods of predicting relative sunspot numbers are reviewed (Willett Chvojková, Kopecký, Gleissberg, Eigenson, Brodovickiĭ). All such methods are found to be unreliable due to lack of knowledge of the physical processes involved in the formation

f sunspots. A table of monthly relative sunspot numbers since 1749 is included. *Subject Headings:* **1. Forecasting sunspot relative numbers 2. Sunspot periodicities.**—*G.T.*

11.5–95 523.77:551.521.3 551.590.21

Michard, R. (*Meudon Observatory*), **Nouvelles promesses de la spectroscopie du Soleil,** [New prospects for solar spectroscopy.] *L'Astronomie*, Paris, 73(4):155–165, April **1959.** figs., plate, table. **DLC**—Short report of the various research carried out in solar spectroscopy and enumeration of various present-day problems in this field. Describes the 9 m spectrograph at the Observatory of Paris-Meudon. Author gives the various peculiarities and numerous possibilities of this instrument. The present research program with the spectrograph at Paris-Meudon is concerned principally with: a) distribution of temperatures, pressures and electronic pressures in the sunspot and its vicinity and their changes according to depth; b) structure, turbulence and regulated movements of the matter in umbra, penumbra and vicinity; c) distribution of the magnetic field. *Subject Headings:* **1. Solar spectroscopy 2. Spectrographs of Meudon Observatory, France.**—*A.V.* Ⓢ

11.5–96 551.521.1:523.745 523.77

Michard, Raymond, **Le spectre optique des éruptions solaires.** [Optical spectrum of solar eruptions.] *Académie des Sciences. Paris, Comptes Rendus*, 248(3):365–368, Jan. 19, **1959.** 3 refs. **DWB, DLC**—About 200 spectra resulting from more than 60 different phenomena have been obtained by means of a device built at the Observatory of Paris. This device, especially designed for the spectroscopy of eruptions and other solar phenomena, has been developed according to the French program for the IGY. The semiquantitative study of this device has resulted in new laws relating to the Balmer spectrum, metallic lines and the D_2 line. The frequent presence of a continuous spectrum is demonstrated and the properties of this spectrum are described. The intensity of an eruptive continuous spectrum increases very rapidly in the violet and near ultraviolet. The emission of a continuous is restrained to initial phases at eruption and, finally, the eruptive continuous spectrum increases very strongly, as concerns visibility, near the edge of the disk. *Subject Headings:* **1. Spectroscopic method 2. Balmer spectrum 3. D_2-line 4. Solar eruption spectra 5. Observatory of Paris, France.**—*A.V.* Ⓢ

11.5–97 523.75

Öhman, Yngve, **Die grosse Sonneneruption von 20. Januar 1957.** [The important solar eruption of Jan. 20, 1957.] *Die Sterne*, Leipzig, 34(1–2):1/2, **1958.** fig. **DLC**—Some data are given for the important solar eruption of Jan. 20, 1957. A photograph of the aurora taken on Jan. 21, at Capri (Italy) with a calcium H-filter is shown and commented on. The article further describes the installation for solar observation established at Capri by the Swedish observatory. *Subject Heading:* **1. Solar eruption.**—*A.V.*

11.5–98 523.7

Öhman, Yngve, **Ein Instrument zur Überwachung der Sonne.** [An instrument for observing the sun.] *Die Sterne*, Leipzig, 34(3/4):79–80, **1958.** fig. **DLC**—A photograph shows the arrangement of an instrument for permanent observation of the sun at the Swedish station on Capri. The author gives a technical description of the instrument that makes observation possible under different conditions. *Subject Headings:* **1. Solar observatories 2. Swedish Observatory, Capri.**—*A.V.*

11.5–99 523.746

Voigt, H. H., **Flecken in heliographischen Breiten >40°.** [Sunspots in solar latitudes above 40°.] *Die Sterne*, Leipzig, 35(5/6):118–119, May/June **1959.** table, 2 refs. **DLC**—Occurrences of long-lived sunspots observed in such high latitudes as 40° during the present sunspot cycle are being catalogued for the period 1874 to 1957. A detailed description of the most important one ever observed (June 14, 1957 to July 24, 1957) is given. *Subject Headings:* **1. Solar activity 2. Sunspot observation at high latitudes.**—*A.V.* Ⓢ

11.5–100 523.

Warwick, C. and Wood, M. (*both, Natl. Bur. of Standards, Boulder, Colo.*), **A study of li flares and associated events.** *Astrophysical Journal*, Chicago, 129(3):801–811, May 19 6 figs., 4 tables, 14 refs. **DWB, DLC**—Measured heights of limb flares were used to deriv frequency distribution of flare height and to assess the importance of height in the product of flare-associated events. The observed height distributions can be explained by a r distribution with maximum at zero, decreasing toward greater heights. The occurrence SWF (short wave fadeout) depends strongly on flare height. This dependence could be plained as an effect either of absorption of the ionizing radiation in the sun's atmosphere or a mechanism of production of ionizing radiation that depends critically on the height of flare. Center-to-limb variation of SWF occurrence, while not conclusive, favors the form interpretation. The relation between optical flare characteristics and occurrence of associat bursts of radio noise is strongest for decimeter bursts and weaker for bursts at meter wa lengths. *Subject Headings:* **1. Solar flare heights 2. Solar flare effects.**—*Authors' abstract*

11.5–101 523.

Xanthakis, Jean, **L'asymétrie N-S dans l'activité solaire.** [The N-S asymmetry in so activity.] *Académie des Sciences, Paris, Comptes Rendus*, 249(16):1458–1459, Oct. 19, 19 fig., 5 refs. **DWB, DLC**—The ratio $q=(N-S)/(N+S)$ (where N and S represent respective for each year, the areas of sunspots to the north and the south of the sun's equator), can expressed as a function of the ascension time and with two periodical terms, their periods be 2 and 4 solar cycles. Examining the yearly values of the ratio q has shown that this quant presents large fluctuations in each cycle. The slopes of the curves q present a progress change from negative to positive, considering positive direction the one towards the north the sun's equator. *Subject Headings:* **1. Solar activity 2. Sunspot cycles.**—*A. V.* Ⓢ

3. PLANETS

See also: **Planetary radio emission** (Kraus), 11.5–158.

11.5–102 523

†Beard, David B. (*Univ. Calif., Davis, Calif.*), **Interplanetary dust distribution.** *Astr physical Journal*, Chicago, 129(2):496–506, March **1959.** 2 figs., table, 22 refs., 27 eqs. **DW DLC**—A detailed calculation of the dust-scattered light at very small elongations from the s (2–10 solar radii) reveals (1) that the dust is distributed as r^{-v}, where r is the distance from t sun and v is some number possibly less than, but most probably equal to, 1.5; (2) that t minimum radius of the dust particles is a few microns; (3) that the particle concentrati depends on the particle radius, a, as a^{-p}, where p is a number possibly equal to, but m probably greater than, 2.5; (4) that the scattered light should depend linearly on the squa root of the wave length of the light; (5) that the concentration of dust at the earth's orbit to a good approximation, 10^{-14}–10^{-15} particle/cc; but (6) that, because of the earth's gravit tional field, the concentration at the earth's surface may be increased for as much as 10^{-10}–10^{-} particle/cc. A less precise calculation of the zodiacal light observed at large elongations fr the sun (greater than 30°) favors the upper limit to v for the radial distribution of the coron calculation and confirms the absolute value of the concentration inferred from the solar coro if the dust albedo is assumed to be approximately 0.1. *Subject Heading:* **1. Interplanetary du distribution.**—*Author's abstract.* Ⓢ

11.5–103 523

*†DeMarcus, Wendell C., **Planetary interiors.** *Handbuch der Physik*, Berlin, 52:419–44 **1959.** 3 figs., 14 tables, numerous refs., 12 eqs.—Theoretical models are presented and d cussed for the mass and radius of cold planetary bodies, their figure, features, structure and t composition of terrestrial and Jovian planets, of Jupiter and Saturn, of Uranus and Neptu Data through 1958 are presented in tables and graphs. *Subject Headings:* **1. Planetary i teriors 2. Jovian planets 3. Terrestrial planets 4. Cold bodies 5. Planetary structu 6. Planetary composition.**—*M. R.* Ⓢ

11.5–104 523.346:523.167

Gold, Thomas (*Prof. of Astronomy, Harvard College Obs.*), **Dust on the moon.** *U. S. Air Force. Office of Scientific Research, Vistas in Astronautics: second annual Symposium, April 1958.* pub. N. Y., Pergamon Press, **1959.** p. 261–266. 2 figs., 5 refs. **DWB** (629.1388 U581as)—Craters on the moon are said to be due to explosions produced by high velocity meteor impact rather than volcanic activity as was previously believed. Evidence against the lava flow theory of "maria" is presented. Time sequences can be established in areas of overlap of crater rims and from evidence of erosion of rims. Dust migration accounts for level crater bottoms. No evidence of crustal distortions exists, leading one to suspect that no volcanism was going on during the period when the craters were being formed. Radar spectra indicate very smooth surfaces (as snow on earth) down to very fine grain and thus no great volcanic or stony structure. *Subject Headings:* **1. Lunar surface 2. Lunar dust 3. Lunar crater 4. Moon.**—*M. R.* Ⓢ

11.5–105 523.3

Kuiper, Gerard P. (*Yerkes Obs.*), **The exploration of the moon.** *U. S. Air Force. Office of Scientific Research, Vistas in Astronautics: second annual Symposium, April 1958.* pub. N. Y., Pergamon Press, **1959.** p. 273–313. 23 figs., 10 refs. **DWB** (629.1388 U581as)—An exceedingly vivid, illustrated account of the size, shape, surface, maria and other topography of the moon as now known and photographed, and conclusions as to the significance of further exploration of its surface in terms of knowledge of the history of the earth and universe for the last 5 billion years. *Subject Headings:* **1. Lunar exploration 2. Lunar topography 3. Moon.**—*M. R.* Ⓢ

11.5–106 522:523.3(09)

Seeger, Raymond J. (*Natl. Science Foundation*), **Moon bound.** *Washington Academy of Sciences, Journal*, 49(2):42–44, Feb. **1959.** 12 refs. **DLC**—The nature of the moon's surface, history of man's discovery of the features of the moon, the moon in science fiction, Newcomb's fictional and professional attitudes toward astronautics and aeronautics, and philosophical reasons for exploring the moon and space are discussed. *Subject Headings:* **1. Lunar exploration 2. History of lunar observations 3. Moon.**—*M. R.* Ⓢ

11.5–107 523.3

Urey, H. C.; Elsasser, W. M. and Rochester, M. G. (*all, Univ. of California*), **Note on the internal structure of the moon.** *Astrophysical Journal*, Chicago, 129(3):842–848, May **1959.** 1 table, 11 refs., eqs. **DWB, DLC**—The irregular shape of the moon can be explained by assuming that its density varies with angular position and possibly also with the radius, and it is shown that great strength in the deep interior is not required in this model. The outer parts must have great strength in order to account for certain surface irregularities. It is suggested that the external parts are now, and have been since the surface features were established, colder and hence more rigid than those of the earth. The irregularities in density indicate that some 10^{-4}–10^{-5} masses of matter of variable density were required in the moon's formation. The variable density is inconsistent with its accumulation from small objects only or with a generally high-temperature state at any time. *Subject Headings:* **1. Moon's internal structure 2. Moon's surface.**—*Authors' abstract.* Ⓢ

11.5–108 551.521.12:523.4

Hardie, R. H. and Giclas, H. L. (*both, Lowell Obs.*), **A search for solar variation.** *Astrophysical Journal*, Chic., 122(3):460–465, Nov. **1955.** fig., 4 tables, 9 refs., eqs. **DWB, DLC**—Photometric observations of Uranus and Neptune made from 1949 to 1954 are presented and discussed in relation to possible variations in the visible solar radiation. These point to the unlikelihood of any variations in excess of about 0.004 mag. during this time. The techniques which have been used to attain high accuracy are described. *Subject Headings:* **1. Solar radiation variations 2. Planetary brightness.**—*Authors' abstract.*

11.5–109 551.58:52

†Richardson, Robert S. (*Mt. Wilson and Palomar Obs., Carnegie Inst. of Washington a Calif. Inst. of Technology*), **A survey of conditions on Mars and Venus.** *Navigation*, L Angeles, 6(1):43–46, Spring **1958.** 2 photos, 26 refs. **DLC**—The Martian climate and possib crustose-lichen plant life on Mars are discussed. A cold, high-altitude type of climate exists Mars. Temperature at subpolar point is 10°C and at the limb −13°C. Radiation cannot measured directly but has been estimated at −100°C. Venus radiation occurs at −40°C a it has not been possible to detect lines of water vapor nor of oxygen but surrounding Ven is a cloud layer which consists of H_2O. The author describes his radio observations of Ven (February to July, 1956), as well as its rotation. The result on rotation showed an equator velocity of −0.032 km/sec, with a mean standard error of ±0.033 km/sec. *Subject Headin* **1. Martian meteorology 2. Planetary climates 3. Venus.**—*N.N.*

11.5–110 551.521.64:52

Poloskov, S. M., **Vozdeĭstvie korpuskuliarnogo izlucheniia Solntsa na komety.** [Effe of solar corpuscular radiation on comets.] (In: Akademiia Nauk SSSR. Komissiia Issledovaniiu Solntsa, **Fizika solnechnykh korpuskuliarnykh potokov i ikh vozdeĭstvie verkhniuiu atmosferu zemli.** Moscow, **1957.** p. 96–104. 11 refs.) **DLC** (QB531.A5)—T action of solar corpuscular rays on: 1) movement of ions in the gaseous tails of comets; 2) excit tion of molecules in comets to luminescence; 3) formation of molecules of C_2 giving spectr bands at 4050 Å; and 4) ionization of molecules in comets, is discussed on the basis of eviden accumulated to 1957. *Subject Headings:* **1. Solar corpuscular radiation effect on come 2. Ionization of comets.**—*M.R.*

11.5–111 523

*†Wurm, Karl, **Die Kometen.** [Comets.] *Handbuch der Physik*, Berlin, 52:465–51 **1959.** 31 figs., 15 tables, numerous refs., 19 eqs.—A well illustrated review (in German) knowledge up to 1958 of comets, their trajectories, unusual comets, spectra and physi composition, polarization, dynamics, cosmogony and long period-short period comets. Elev different comets are discussed and illustrated in some detail. Heads, tails, nuclei, group brightness, orbits, and shapes are considered in addition to the more technical spectral a chemical aspects. *Subject Heading:* **1. Comets.**—*M.R.*

4. ECLIPSES

See also: **Solar eclipse effects on geomag.** (Srivastava, Sivasankara Sastri), 11.5–148; **Solar eclipses** (Minnis), 11.5–161; **IGY eclipse expedition** (Friedman), 11.5–175.

11.5–112 523.78:551.527

d'Anglejan-Chatillon, Pierre and Dauvillier, Alexandre, **Observation de l'éclipse tota de soleil du 12 octobre 1958.** [Observation of the total eclipse of the sun on Oct. 12, 1958 *Académie des Sciences, Paris, Comptes Rendus*, 248(9):1265–1267, March 2, **1959. DWB, DI** —The authors made visual, photographic and photometric observation of the total eclip of the sun on Oct. 12, 1958, in Maupihaa atoll (French Polynesia). Visual observations wc made with a Wild T2 theodolite. In taking photographs of the corona, panchromatic emu sions and filters were used in order to eliminate the veil resulting from atmospheric diffusio Global intensity of the corona was measured by photoelectrical photometry. These observ tions revealed a corona of maximum activity, highly developed and very luminous, extendi to more than 8 solar radii. The intensity of light measured has reached 0.78 candle power/ i.e. 2.8 times the degree of illumination produced by a full moon. *Subject Headings:* **1. Sol eclipses 2. Coronal observation 3. Maupihaa, Leeward Islands.**—*A.V.* Ⓢ

11.5–113 523.78 551.593:551.590.

de Boer, A. H., **De vliegende schaduwen bij de zonsverduistering van 2 oktober 19** [The flying shadows during the total sun eclipse on Oct. 2, 1959.] *Hemel en Dampkring*, T Hague, 57(11):269–270, Nov. **1959. DWB, DLC**—The observations of "flying shadows" fr the total sun eclipse on Oct. 2, 1959 at Las Palmas, Grand Canary Island, are described. T

shadows were observed on a large bed-sheet, spread on the ground. However irregular and volatile the shadows, they showed a joint direction. The shadows after the totality of the sun eclipse were directed differently than those before the totality. The direction of the shadows is determined by the air current at a certain height above the place of observation. *Subject Headings:* **1. Solar eclipse, Oct. 2, 1959 2. Flying shadows 3. Las Palmas, Grand Canary Island.**—*A. V.* Ⓢ

11.5–114 523.78

van den Bergh, G., **De totale zonsverduistering te Las Palmas de Gran Canaria.** [The total sun eclipse at Las Palmas on Grand Canary.] *Hemel en Dampkring*, The Hague, 57(11):266–268, Nov. **1959.** fig. **DWB, DLC**—The author describes his visual observations during the course of the total eclipse of the sun at Las Palmas, Grand Canary Island, on Oct. 2, 1959. *Subject Headings:* **1. Solar eclipse, Oct. 2, 1959 2. Las Palmas, Grand Canary Island.** —*A. V.* Ⓢ

5. METEORS

11.5–115 523.51

Baker, Robert M. L., Jr. (*Aeronutronic Systems, Glendale, Calif.*), **Ephemeral natural satellites of the earth.** *Science*, Wash., D. C., 128(3333):1211–1213, Nov. 14, **1958.** fig., 5 refs., 6 eqs. **DLC**—A discussion is presented of transient or short-lived natural satellites of the earth, which result from meteorites that only graze our atmosphere. Preliminary calculations show that only about 0.2% of the total number of the porous, stony meteorites which strike the earth will result in natural satellites. It is noted that such satellites also would be difficult to detect observationally. *Subject Heading:* **1. Meteorite orbits.**—*Author's abstract.*

11.5–116 523.51

Beals, C. S., **Fossil meteorite craters.** *Scientific American*, N. Y., 199(1):32–39, July **1958.** 10 figs. **DWB, DLC**—Some 40,000 Canadian aerial mapping photos were studied and it was found that about a dozen revealed circular topographic features indicating cataclysmic origin, subsequently confirmed by field investigations. Some of the craters, such as the great Baringer in the Arizona desert, contain fragments of the meteorite itself which is composed of nickel-iron and iron oxide. The known craters originated 50,000 to 6,000,000 yrs ago, except one in 1908 and another in 1947 close to Vladivostok. The shape of the craters indicates detonation. It is estimated that a meteorite can reach a speed of up to 20 mi/sec. equivalent energy of which is 65 times its weight in nitroglycerine. This explains the absence of ore body at a crater's bottom and likewise why fragments are found outside rather than within the rim. The riddle of lunar craters may be solved on the same basis. *Subject Heading:* **1. Meteorite craters.**—*W. N.*

D. OUTER ATMOSPHERE

1. COSMIC RAYS

See also: **Solar eruption-cosmic ray relationships** (Avignon, Pick), 11.5 154; **Satellite cosmic ray obs.** (Rothwell, McIlwain), 11.5–169.

11.5–117 551.521.64

†Cranshaw, T. E.; de Beer, J. F.; Galbraith, W. et al. (*Atomic Energy Research Establishment, Harwell*), **The ratio of the soft to penetrating components and their attenuation in the atmosphere (Observations on extensive air showers, Pt. 6).** *Philosophical Magazine*, 8th ser., 3(32):811–825, Aug. **1958.** fig., 3 tables, 25 refs., 17 eqs. (For Pt. 1 and 2, *see* 8.11–183, Nov. 1957; for Pt. 5, *see* 10.2–117, Feb. 1959; for Pt. 7, *see* 11.5–122, May 1960, *MAB.*) **DWB** —The paper describes measurements of the ratio of μ-mesons to electrons as a function of shower size and barometric pressure for showers containing about 5×10^6 particles at sea level. Measurements on the change of rate with atmospheric pressure and temperature are also described, and it is shown how, on the assumption that all showers suffer the same attenuation,

these measurements yield the attenuation lengths of electrons and μ-mesons. At each stag the measurements are compared with the results of other experiments, and finally with vario theories of the nucleon cascade. It is shown that none of the theories fits the data well, a that one may suspect the assumption of similar attenuation for all showers. Possible mech nisms giving rise to a distribution of attenuation lengths are briefly discussed, and a case ma for an experimental investigation of this point. *Subject Headings:* **1. Cosmic ray showe 2. Atmospheric effects on cosmic rays. I. Hillis, A. M. II. Norris, S. III. Porter, N. A.** *Authors' abstract.*

11.5–118 550.38:551.521.

Danielson, Robert E. (*School of Physics, Univ. of Minnesota, Minneapolis*), **Geomagnet measurements on heavy primary cosmic radiation near the equator.** *Physical Review*, N. Y 113(5):1311–1322, March 1, **1959.** 14 figs., 3 tables, 18 refs. **DWB**—The azimuthal angul distribution of primary cosmic radiation with charges $Z \geqslant 6$ has been measured near the ge magnetic equator (at Guam) in horizontal emulsions with known orientation relative to t earth. The observed distribution is well described by using the centered-dipole approximatio to the earth's surface magnetic field (north pole at 79°N and 70°W) if the effect of the sol earth is included by assuming that the main cone is the allowed cone. This verifies the pr diction that the penumbra becomes forbidden near the geomagnetic equator. The main-co equatorial cutoffs were applied to an assumed integral energy spectrum which is inverse proportional to the α power of the total energy per nucleon. The exponent α was found to l at least 1.82 ± 0.19. *Subject Headings:* **1. Cosmic ray distribution 2. Geomagnetic effects c cosmic rays.**—*Author's abstract.* Ⓢ

11.5–119 523.1

Firkowski, R. and Zawadzki, A. (*Inst. des Recherches Nucléaires de l'Académie Polonai des Sciences*), **L'analyse des méthodes de mesure du coefficient *y* des grandes gerbes d rayonnement cosmique.** [Analysis of measurement methods of the *y* exponent of extensiv air showers from cosmic radiation.] *Journal de Physique et le Radium*, Paris, 20(4):456–46 April **1959.** 13 refs., eqs. French and English summaries p. 456. **DLC**—The formal analys of the two measurement methods of the *y* exponent (A: variation of the order of the coincidenc B: variation of the area of the counter trays) shows that they are not complementary ind pendently of the existence of the density gradient in the horizontal section of the extensive a shower. The presence of the density gradient causes an apparent increase of the *y* value determined by the method A. By using a hodoscopic arrangement which makes it possib to record simultaneously threefold, fourfold, fivefold and sixfold coincidences we can sho that the *y* value obtained by method A is higher than the value obtained by method B an that the value increases with the order of coincidence. All the conclusions have been base on a single set of measurements of 124,000 coincidence records. By using an appropria computing method we have taken advantage of all possible recording combinations; this w possibly due to the transition from coincidences of a given order to coincidences which are least of the given order (e.g., from threefold coincidences to at least threefold coincidences This fact considerably reduces the statistical errors. *Subject Heading:* **1. Cosmic radiation.** *Authors' abstract.* Ⓢ

11.5–120 551.521.64:551.590.21 523.7

Fréon, André; Berry, Jacques and Coste, Jean-Pierre, **Sur les variations récurrent d'intensité du rayonnement cosmique primaire en période de maximum d'activité solair** [Recurrent variations in the intensity of primary cosmic radiation during periods of maximu solar activity.] *Académie des Sciences, Paris, Comptes Rendus*, 248(5):674–677, Feb. 2, 195 2 figs., 8 refs. **DWB, DLC**—Recordings of changes in intensity of cosmic neutrons made sin October 1956 at the Pic du Midi Observatory and since July 1957 in the Kerguelen Islan reveal the existence, since the beginning of observation and for at least 20 solar rotation of a cyclic change with a stable period equal to 27.35 ± 0.1 mean solar days, and a maximu amplitude equal to 2.2%, reached in October 1957. In connection with this study, a stab coronal activity during the same period has been found, located near lat. 20°N and long. 35

a location which corresponds approximately to the one where the authors observed the maximum of disturbances. The apparent period found agrees with that of the sun's surface rotation at lat. 16.5±1.5°N and S, value in concordance with the mean latitude of optical phenomena, spots and corona, during this phase of the sun's cycle. *Subject Headings:* **1. Cosmic ray intensity 2. Solar influences on cosmic radiation 3. Pic du Midi, France 4. Kerguelen Islands.**—*A. V.* Ⓢ

11.5–121 537.59:551.521.64

Peters, B. (*Tata Inst. of Fundamental Res., Bombay*), **Progress in cosmic ray research since 1947.** *Journal of Geophysical Research*, Wash., D. C., 64(2):155–173, Feb. **1959.** 3 tables, bibliog. p. 173, eqs. **DLC**—Cosmic ray physics, which ten years ago was a fairly specialized branch of science, has in the course of its recent development become closely linked with many other fields of research. It has become an integral part of astrophysics, radio astronomy, and solar physics; it has made important contributions to such diverse fields as geomagnetism, hydrology, and archeology, and has begun to gain some importance in the study of meteorites and of oceanography and meteorology. It has also given rise to one of the newest and most active branches of physics, 'particle physics,' and has thereby provided the impetus for designing the large and powerful particle accelerators which are now in operation or under construction in various parts of the world. This paper is a survey of the most important developments which have taken place in cosmic ray physics during the last decade. The principal technical advances which have exerted decisive influence on cosmic ray research are the development of large stratosphere balloons, of nuclear emulsions, and of radio telescopes, as well as the great progress made since the war in radio chemistry and in low level beta- and gamma-ray counting. The three sections following the introduction discuss how, with the help of these and other techniques, the nature of the primary cosmic ray particles was determined and how a connection was established between cosmic ray effects and astrophysical and solar phenomena. The next section deals with largely successful efforts which have been made to understand the complicated chain of processes by which the energy carried by primary cosmic ray particles entering from outer space is first distributed over a great variety of new stable and unstable particles and finally is dissipated within the atmosphere. The two following sections treat the discovery of stable and radioactive isotopes which are produced during the passage of cosmic radiation through the atmosphere and contain a short review of the application which these isotopes have found in other branches of science. The last section contains a brief discussion of still unsolved problems which have now become accessible because of more recent technical advances such as satellites, permanent polar stations, and synoptic cosmic ray observations during the International Geophysical Year. *Subject Heading:* **1. Cosmic ray research.**—*Author's abstract.* Ⓢ

11.5–122 551.521.64:537.533:539.12

Porter, N. A.; Cranshaw, T. E.; de Beer, J. F. et al. (*Atomic Energy Res. Estab., Harwell*), **The lateral distribution of energy in the electron-photon component (Observations on extensive air showers, Pt. 7).** *Philosophical Magazine*, 8th ser., 3(32):826–830, Aug. **1958.** 2 figs., 12 refs. **DWB**—The energy density of the electron-photon component has been measured at distances of 60–500 m. from the axis of showers containing 3×10^3 particles at sea level. The mean electron energy appears to be constant, and close to the critical value of 84 Mev, over this region. A lower limit for the energy appearing in the soft component of these showers at sea level is set at 6×10^{11} ev. *Subject Headings:* **1. Electron energy 2. Electron-photon component. I. Parnham, A. G. II. Sherwood, A. C.**—*Authors' abstract.*

11.5–123 537.59

Salim, S.; El-Fattah El-Nadi, Abd and Ortner, G., **On the close pair effect in cosmic ray stars.** *Mathematical and Physical Society of Egypt, Proceedings*, No. 21:113–117, May 1957, pub. **1958.** 2 figs., 2 tables, 6 refs., eqs. **DWB**—Photographic plates exposed at mountain altitudes (3650 and 2300 m) were examined for the close pair effect and two tests were applied which showed that the distribution of cosmic ray stars conform to a random distribution for distances $\leqslant 1$ mm. *Subject Headings:* **1. Cosmic ray stars 2. Close pair effect.**—*Authors' abstract.*

11.5–124 523.

Singer, S. F. and Wentworth, R. C. (*both, Univ. of Maryland*), **Cosmic-ray measuremen in the vicinity of planets and some applications, Pt. 1, Primary cosmic radiation.** *Journal Geophysical Research*, Wash., D. C., 64(11):1807–1813, Nov. **1959.** 6 figs., 9 refs., 14 ec **DLC**—The variation of the primary cosmic ray intensity is calculated as a function of distan from a dipole in its equatorial plane. Different values of spectrum exponent and of minimu momentum are chosen. Results are presented in a general form but are also specialized to t case of the moon. Scientific applications are indicated, such as determination of the cosm ray energy spectrum and low-energy cutoff, cause of the 'knee' and of Forbush decrease value of the free-space cosmic-ray flux, and determination of magnetic fields of the moon a the planets. The present paper deals only with the primary cosmic rays; the cosmic r albedo which produces the 'radiation belt' is discussed in Pt. II. *Subject Heading:* **1. Prima cosmic ray intensities.**—*Authors' abstract.* Ⓢ

2. IONOSPHERE

See: Bibliog. on **Ionospheric radio propagation,** p. 742–782.

3. AURORAS

See also: **Auroras** (Isaev, Pushkov), 11.5–9; **Auroral temps.** (Armstrong), 11.5–132; **Auroral particles** (Wentworth et al.), 11.5–152.

11.5–125 551.594.5 551.521.3

Barbier, Daniel, **L'observation des aurores polaires et de la lumière du ciel nocturn pendant l'Année Géophysique Internationale.** [Observation of polar auroras and night a glow during the IGY.] *La Nature*, Paris, No. 3294:439–443, Oct. **1959.** 5 figs. **DLC**—T article presents a brief report on the morphology of polar auroras and night airglow, and co siderations relating to the observation of these two phenomena during the IGY. The metho of auroral detection are described and also the methods used at the Observatory of Hau Provence (France) which led to discovery of a new phenomenon called "monochromatic arc The author describes this phenomenon and treats briefly of radioelectric exploration of auror artificial auroras, exploration of auroras by rockets and of the spectrum of auroras. Auror exploration by rockets has shown that the auroras producing radiation particles are essential electrons with energies less than 100 kev. Fast electrons, when decreasing speed, cause radiation and play an important part in aurora production. Spectral auroral observati reveals some particular spectra, formed by atomic rays of neutral and ionized oxygen a neutral and ionized nitrogen. It shows that hydrogen rays may occur one or two hours bef the beginning of the aurora and that there is a correlation between their extent and the presen of radioelectric echoes. *Subject Headings:* **1. Auroras 2. Night airglow 3. Radio echo from auroras 4. Auroral spectra 5. International Geophysical Year, 1957–1958.**—*A. V.* Ⓢ

11.5–126 551.594

Chamaraux, Pierre, **L'aurore boréale du 15–16 juillet 1959.** [The aurora of July 15–1 1959.] *L'Astronomie*, Paris, 73(7/8):328–329, July/Aug. **1959. DLC**—Report of the visu observation of the aurora which was seen at Auxerre (France) during the night of July 15–1 1959. *Subject Headings:* **1. Aurora of July 15–16, 1959 2. Auroral observations 3. Auxer France.**—*A. V.* Ⓢ

11.5–127 551.594

Chamberlain, Joseph W. and Thorson, Helene M. (*both, Yerkes Obs., Univ. Chicag* **The nightly variation of auroras at a subauroral station.** *Journal of Geophysical Researc* Wash., D. C., 65(1):133–136, Jan. **1960.** 2 figs., 17 refs. **DWB, DLC**—The observi records of E. E. Barnard and more recent patrol photographs of the sky have been studi for an indication of a nightly variation in the occurrence of auroras at Yerkes Observator There appears to be a maximum probability in the neighborhood of local magnetic midnig as at stations closer to the auroral zone. Some implications to auroral theory are discusse *Subject Heading:* **1. Auroral variation.**—*Authors' abstract.* Ⓢ

11.5–128 551.521.14:551.594.5

Dauvillier, Alexandre, **Activité aurorale et albedo planétaire.** [Auroral activity and planetary albedo.] *Académie des Sciences, Paris, Comptes Rendus*, 248(12):1740–1743, March 23, **1959.** 6 refs. **DWB, DLC**—Author shows that an 11-year fluctuation of terrestrial albedo probably results from an equilibrium between the production of an ammonium nitrite crystalline aerosol through auroral activity and its destruction through the thermal effect of solar flashes. All the phenomena in which atmospheric absorption plays a part, are influenced by this aerosol. On the other hand, the nitrite formed in the E layer is rapidly driven into the lower atmosphere through ionospheric turbulence, and there it acts as condensation nuclei for forming cirrus which follow auroral storms after a delay of two days. *Subject Headings:* **1. Auroral activity 2. Terrestrial albedo 3. Aerosols 4. Ionospheric turbulence.** —*A. V.* Ⓢ

11.5–129 551.521.326:551.594.5:535.247

Dzhordzhio, N. V., **Elektrofotometricheskie izmereniia v zone poliarnykh siianiĭ.** [Electrophotometric measurements in the auroral zone.] (In: Krasovskiĭ, V. I., *(ed.)*, **Spektralnye, elektrofotometricheskie e radiolokatsionnye issledovaniia poliarnykh siianiĭ i svecheniia nochnogo neba.** Issued Moscow, Akademiia Nauk SSSR, **1959.** p. 41–54. 12 figs., 3 tables, 5 refs.) English transl. by J. Miller of original Russian issued July 1959, by American Meteorological Society, under Contract AF 19(604)-1936, as its Transl. T-RC-14+.—At the Loparskaya station the electrophotometric measurements of the night airglow and auroral emissions were carried out under the IGY program. The intensity of the airglow emissions at Loparskaya ($\varphi = 69°$) is 1.5–2 times that in Zvenigorod ($\varphi = 56°$). The mean ratios of the main emissions in different auroral forms were obtained from a large number of measurements. The intensity changes of λ6300 Å in the red rays RR are opposite those of the λ5577 and 4278 Å. It is shown that the main part of the radiated energy is emitted not in the bright auroral forms but in the diffuse background around them in most auroras. The short period emission intensity variations in auroras were studied. The period of the pulsations is of the order or several seconds. The spatial velocity of the wavelike intensity changes is several kilometers per second. *Subject Headings:* **1. Night airglow emissions 2. Auroral emissions 3. Electrophotometric measurement.**—*From author's abstract.* Ⓢ

11.5–130 551.521.67:551.594.5

Malville, J. M., **Solar corpuscules and the aurora.** (In: Chicago Univ. Yerkes Observatory, Williams Bay, Wisc., Contract AF 19(122)-480, Technical Report, No. 22, Symposium on auroral observations during the IGY, Sept. 17–26, 1956, pub. **1956.** p. 30–40. 29 refs.) **DWB**—Evidence for solar corpuscular origin of aurora was first presented in 1939 by Vegard, who discussed high intensity Hα and Hβ lines in spectrogram. Gartlein calculated a velocity of 400 km/sec for hydrogen atoms. Meinel observed a Doppler shift toward ultraviolet in hydrogen spectrum on Aug. 18–20, 1950 and Mode microphotometer tracing of spectrogram showing luminosity curves for various wave lengths and noticed that when the arc broke up the H emission disappeared. Comet tails, geomagnetic, ionospheric and cosmic ray relationships are discussed. *Subject Headings:* **1. Corpuscular theory of aurora 2. Solar corpuscular emissions. I. Chicago Univ. Yerkes Observatory, Williams Bay, Wisc. II. Contract AF 19(122)-480.**—*M. R.*

11.5–131 551.521.9:551.593.55:551.594.5/99

Weill, Gilbert, **Aurores polaires et phénomènes crépusculaires observés en radiation 3914 Å dans l'Antarctique.** [Polar auroras and twilight phenomena observed in the 3914 Å radiation, in the Antarctic regions.] *Académie des Sciences, Paris, Comptes Rendus*, 249(20): 2092–2094, Nov. 16, **1959.** fig., 7 refs. **DWB, DLC**—During the IGY, photometric observations of auroras were made at Dumont d'Urville Station, in Adélie Land. Author describes the characteristics of the phenomena recorded; he reports on the methods used for analyzing the observations and presents some statistical results from systematical observations of the N_2^+ 3914 line. A diagram showing the probability for observing an aurora, in function of time and azimuth, is established. This azimuth-time diagram is very asymmetric, showing that in addition to the auroras observed in direction of the geomagnetic North, phenomena often

appear in the West at evening, in the East at morning. These last auroras are situated at t height over 350 km, lighted by the sun and visible through optical resonance. Author note on the other hand, that auroras and twilight phenomena observed in 3914 Å radiation wer closely bound together and often inseparable. This composite auroral phenomenon impli the permanent presence of N_2^+ ions in the polar upper atmosphere. The concentration of thes ions is very large compared with that existing at middle latitudes. *Subject Headings:* **1. Auror observations 2. Auroral nitrogen lines 3. Twilight phenomena 4. Upper atmosphe ionization 5. Dumont d'Urville, Adélie Land.**—*A. V.* Ⓢ

4. AIRGLOW

11.5–132 551.521.326:551.524.7:551.594.5

†Armstrong, E. B. (*Queen's Univ. of Belfast*), **The temperature in the atmospheric regio emitting the nightglow OI 5577 line and in regions above faint auroral arcs.** *Journal Atmospheric and Terrestrial Physics*, London, 13(3/4):205–216, Feb. **1959.** 3 figs., table, 3 refs. **DLC**—A number of observations of nightglow and auroral temperatures made with photoelectric scanning Fabry-Perot interferometer are presented and discussed. The result suggest that the temperature of the region emitting the nightglow λ5577 radiation lies withi the range 180° to 220°K, with a most likely value of 190°K. Temperatures measured abov faint auroral arcs ranged from 310° to 540°K. The published temperatures of the upp atmosphere obtained spectroscopically are surveyed. *Subject Headings:* **1. Upper atmospher temperatures 2. Auroral temperatures 3. Night airglow temperatures.**—*Author's abstract.*

11.5–133 551.521.326:535.3

Blackwell, D. E.; Ingham, M. F. and Rundle, H. N. (*all, Observatories, Univ. Cambridge Eng.*), **The night-sky spectrum λλ5000–6500 A.** *Astrophysical Journal*, Chicago, 131(1):15–24 Jan. **1960.** 4 figs., 9 tables, 19 refs. **DWB, DLC**—The paper describes a spectrum of the nigh sky obtained at the cosmic ray station of Chacaltaya (lat. −16°, height 17,100 ft) at zenit distance 84°, using a dispersion of 78 A/mm. The spectrum is usually intense, and in th region λλ5577–6500 fifty-one OH emission lines (some of which are multiple) are identified the spin doubling of many lines is clearly resolved. A comparison between observed frequencie and frequencies calculated by means of newly derived band origins and rotational constants i given. Rotational temperatures are determined, and the absolute intensities of OH lines an the NI emission at λ5199 have been measured. The fine structure of the OH emission in th region of Hα is calculated. *Subject Headings:* **1. Night sky spectrum 2. OH emission lin intensities.**—*Authors' abstract.* Ⓢ

11.5–134 551.521.32

Chamberlain, Joseph W. (*Yerkes Obs., Chicago Univ.*), **The blue airglow spectrum.** *Astro physical Journal*, Chicago, 128(3):713–717, Nov. **1958.** 3 figs., table, 16 refs. **DWB, DLC**— High-dispersion spectra of the airglow covering the region 3700–4900 Å are discussed in term of possible identifications. A number of Herzberg bands of O_2 appear in this region; a new system of O_2 bands, $^3\Delta_u \rightarrow {}^1\Delta_g$, may explain several weaker features. An airglow continuum is not important in the region around 4000 Å and shortward, but longward of 4500 Å a rea continuum appears to be of dominating brilliance. *Subject Heading:* **1. Airglow spectrum i blue.**—*Author's abstract.*

11.5–135 551.521.32

Chamberlain, Joseph W. and Smith, Clayton A. (*both, Yerkes Obs., Univ. of Chicago*), **On the excitation rates and intensities of OH in the airglow.** *Journal of Geophysical Research* Wash., D. C., 64(6):611–614, June **1959.** 2 figs., table, 12 refs., eqs. **DWB, DLC**—Published photometric observations of several OH bands are analyzed with the aid of available transition probabilities. The rate of excitation of the vibrational levels with $v \leq 9$ by the excitation mechanism seems to be nearly independent of v. The relative populations of the vibrationa levels are computed, and the predicted absolute intensities of all the OH bands are given *Subject Headings:* **1. OH emission line intensities 2. Airglow investigations.**—*Authors' abstract.* Ⓢ

11.5–136 523.77:551.521.326:546.17

Dufay, Maurice, **Présence de la raie interdite $^4S - {}^2D$ de l'atome d'azote dans le spectre du ciel nocturne.** [Presence of the forbidden line $^4S-{}^2D$ of nitrogen atoms, in the night sky spectrum.] *Académie des Sciences, Paris, Comptes Rendus*, 248(17):2505–2507, April 27, **1959.** fig., 4 refs. **DWB, DLC**—The forbidden line $^4S-{}^2D$ (5199 Å) of the nitrogen neutral atom, characteristic of the aurora at low latitudes, is also an almost permanent component of the spectrum of crepuscular sky. This line has been regularly observed during the year 1958–1959 in the night sky spectrum; it presents fluctuations in intensity. Periods of maximum intensity generally persist several days and seem to have a connection with the planetary geomagnetic index. The intensity grows stronger at once with the lines 6300–6363 Å of oxygen. The line 5199 Å of [NI] is generally superposed on the bands 9−2 and 6−0 of OH. *Subject Headings:* **1. Night sky spectrum 2. Nitrogen atom line $^4S-{}^2D$ 3. Planetary geomagnetic index.** —*A. V.* Ⓢ

11.5–137 551.521.326

Hale, D. P., **A survey of the airglow spectra.** (In: Chicago Univ. Yerkes Observatory, Williams Bay, Wisc., Contract AF 19(122)-480), Technical Report, No. 22, Symposium on auroral observations during the IGY, Sept. 17–26, 1956, pub. **1956.** p. 15–25. 34 refs.) **DWB**—Methods of classifying airglow radiations (atomic emissions, molecular bands, airglow continuum), the twilight airglow, variations in the nightglow spectra, heights and motions of the emitting region, temperatures and excitation mechanisms of the airglow, are discussed. The twilight airglow is said to be merely the day airglow observed from the dark side of the earth. Various bands are listed and explained. Various authors obtained heights from 70 to 310 km. Explanation of continual excitation through the night is difficult. *Subject Heading:* **1. Airglow spectra.**—*M. R.*

11.5–138 551.521.326

Liszka, Ludwik (*Inst. of Geophysics, Warsaw Univ.*), **Some remarks about the results of the observations of the (0I)-5577 nightglow at Sacramento Peak in 1955.** *Acta Geophysica Polonica*, Warsaw, 6(3):197–204, **1958.** 5 figs., 3 tables, 6 refs., 8 eqs. **DLC**—The results of observations at Sacramento Peak can provide interesting conclusions. The correlation between the character of the distribution of the fluctuations $R(z,a,t)$ and the solar activity show that this part of the emission arises independently of the part with the regular distribution $I(z,a)\times I(t)$. Since the van Rhijn height refers to the regular layer, the influence of the part of the radiation $R(z,a,t)$ which may originate at heights very different from the height of the regular layer should be eliminated in the calculations of the mean van Rhijn ratios. Different reduction formula used for extinction and scattering give different results. By employing the Piotrowski formula, we obtain the weighted mean height of the layer for the night of April 26 (the only one for which full observational data were published) 89±11 km, which is in good agreement with the results from rockets and from theoretical considerations concerning the distribution of oxygen atoms. *Subject Headings:* **1. Night airglow data 2. Night airglow distribution with height.**—*Author's summary.*

11.5–139 551.521.4

Chiplonkar, M. W. and Kulkarni, P. V. (*both, Dept. of Physics, Univ. of Poona*), **Intensity variation of the night airglow in the tropics.** *Indian Journal of Meteorology and Geophysics*, 9(2):133–136, April **1958.** 4 figs., 11 refs. **DWB, DLC**—In this paper the nocturnal variations in intensity of the airglow at the zenith sky at Poona obtained with a photoelectric method during the period 1954–56 have been reported. The measurements include those obtained without an optical filter and also those obtained with the monochromatic interference filters transmitting the oxygen emission line at λ5577 Å and the nitrogen band at λ4278 Å. The measurements without the filter and with the λ5577 Å filter show a maximum of intensity before midnight while the blue emission does not show such a maximum but only shows a steady fall in intensity from the beginning to the end of the night. These results are wholly contradictory to those obtained by KARANDIKAR in 1933 using photographic method. The results for λ5577 Å emission are given in absolute units and are discussed in relation to those

obtained by workers at other places in higher latitudes. *Subject Headings:* **1. Night airglo in tropics 2. Poona, India.**—*Authors' abstract.*

11.5–140 551.521.32

Morozov, V. M. and Shklovskiĭ, I. S. (*both, Geophys. Inst. of the Academy of Science Moscow*), **On the day airglow.** (In: **The airglow and the aurorae: a symposium.** Londo Pergamon, **1956.** p. 201–203. table, 5 refs.) **DWB** (M94.5 A298)—It is shown that th dayglow measurements are in contradiction to earlier solar-eclipse data. *Subject Heading* **1. Dayglow.**—*Authors' abstract.*

11.5–141 535.34:546.21:551.521.3

Brandt, John C. (*Yerkes Observatory*), **Oxygen red lines in the airglow, Pt. 3, The dayglov** *Astrophysical Journal*, Chicago, 128(3):718–723, Nov. **1958.** fig., table, 13 refs., 18 eq **DWB, DLC**—Dissociative recombination of O_2 and ultraviolet dissociation of O_2 are considere as mechanisms contributing to the λ6300 (O I) dayglow emission, and the total intensity found to be the order of 50 kilorayleighs. *Subject Headings:* **1. Oxygen lines 2. Dayglow.** *Author's abstract.*

5. GEOMAGNETISM

See also: **Geomag. lab. techniques** (Bennett), 11.5–83; **Geomag. effects on cosmic rays** (Danielson), 11.5–118; **Satellite-magnetic field relationships** (Beard, Johnson), 11.5–171; **Paleomagnetism** (Flohn), 11.5–317.

11.5–142 550.385.37 538.69:532.55

Afanas'eva, V. I., **O korotkoperiodicheskikh kolebaniiakh geomagnitnogo polia.** [Short period oscillations of the geomagnetic field.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz* No. 8:1214–1218, Aug. **1959.** 2 figs., table, 8 refs. **DWB, DLC**—Broad studies of shor period oscillations of the geomagnetic field from different magnetic observations with magnetc graphs and fast recording machines are reviewed in reference to the IGY. In spite of differen classification mentioned in literature, only two classes of oscillation are considered by th author: oscillations continued noninterruptedly more than one hour (Pc) and less than on hour (Pt). Attention is also given to the pulsation connected with the "magnetohydro dynamic" oscillation in the external atmosphere. These pulsations are considered as th result of action of different corpuscular formations. The distribution and intensity of pulsa tion, varying with years, winter, summer and hour of the day, are illustrated by a set of graph and discussed in the text. *Subject Headings:* **1. Geomagnetic field fluctuations 2. IGY geomagnetic program.**—*N.P.S.* Ⓢ

11.5–143 550.38:551.521.6

Barnier, Lucien, **Les phénomènes étranges du magnétisme.** [Strange phenomena i magnetism.] *Geographia*, Paris, 89:9–17, Feb. **1959.** 10 figs. **DLC**—Enumeration of som magnetic anomalies and summary of research made in France in the field of paleomagnetism Account of some hypotheses relating to the earth's magnetic field; short description of the su and statements on present knowledge about auroras and cosmic radiation. *Subject Headings* **1. Paleomagnetism 2. Auroras 3. Cosmic radiation.**—*A. V.* Ⓢ

11.5–144 550.38

Bureau, Jean-Louis, **Variations diurnes et annuelles des amplitudes normalisées de débuts brusques d'orages magnétiques à Tamanrasset.** [Diurnal and annual fluctuations o the normalized amplitudes of sudden onsets of magnetic storms at Tamanrasset.] *Académi des Sciences, Paris, Comptes Rendus*, 249(16):1543–1545, Oct. 19, **1959.** 6 figs., 4 refs. **DWB DLC**—The purpose of this study is to show evidence of a local control on the diurnal and annua variations of the amplitudes of sudden onsets of magnetic storms, and to eliminate the grea differences of intensity existing on a world-wide scale between two storms originatin essentially from sources outside the globe. Measurement method and normalization principl are stated. Fluctuations bear on ratios which normalize the amplitudes: autonormalizatio of the quantic $\Delta D/\Delta H$, normalization $\Delta Z/N$, $\Delta D/N$, $\Delta H/N$ by a number N particularizing th storm on world-scale. N can be computed as the average value of the $\Delta_i H$ recorded at no

equatorial low-latitude stations where the diurnal fluctuation of the amplitudes of sudden onsets is weak. Author investigates the diurnal and annual fluctuations in the case of sudden onsets with a positive ΔH. The diurnal fluctuation of $\Delta Z/N$ shows a well-marked minimum at 2 p.m. and approximates to the diurnal fluctuation of the vertical component but appears 2 to 3 hrs earlier. The diurnal fluctuation of $\Delta D/N$ has a maximum about 1 p.m. and a minimum about 7 p.m. These fluctuations are algebraic and the maximum of $\Delta D/N$ at 1 p.m. corresponds, in absolute value, to a minimum. The horizontal component of $\Delta\overline{\mathcal{H}}$ of the disturbance vector accomplishes a rotation during the day. For $\Delta H/N$ the annual fluctuation presents an amplitude of fluctuation more important than the diurnal fluctuation; maximum is reached in July and minimum in November. This annual fluctuation recalls the annual fluctuation of J. Bartels coefficient w_i used for measuring solar radiation and having a tie with the ionosphere. As concerns $\Delta Z/N$ and $\Delta D/N$, one cannot speak of an annual fluctuation properly so called. *Subject Headings:* **1. Magnetic storms 2. Diurnal and annual magnetic variations 3. Tamanrasset, Algeria.**—*A. V.* Ⓢ

11.5–145 550.384.3

†Deutsch, E. R. (*Dept. of Physics, Imp. Col. of Sci. and Tech., London*); Radakrishnamurty, C. and Sahasrabudhe, P. W. (*both, Tata Inst. of Fund. Res., Bombay*), **Palaeomagnetism of the Deccan Traps.** *Annales de Géophysique*, Paris, 15(1):39–59, Jan./March, **1959.** 6 figs., 2 tables, 24 refs. French and English summaries p. 39–40. **DLC**—The possible occurrence in the past of such geophysical processes as continental drift or polar wandering may be investigated through widespread magnetic studies of rocks possessing stable polarization. The plateau basalts of the Deccan Trap formation in India are well suited to this kind of work. In conformity with earlier results (Clegg, Deutsch and Griffiths, **1956**), the magnetizations of over 400 basalt specimens from the Deccan Traps have been found to be aligned in general along a NNW-SSE axis dipping towards the south. In two areas the upper flows had declinations towards the north, whereas the lower flows were reversely polarized as were all the stable flows in the earlier survey. In a further locality, the magnetizations were normal; here some more recent acid tuffs were examined in addition to the basalts and found to have shallow downward dips. The results are consistent with the interpretation that India has drifted northward through 50° of latitude and rotated 25° anticlockwise within the last 70 million years. It is considered plausible that the "reversed" specimens acquired their thermoremanence when the Earth's field was itself reversed. Ancient pole positions corresponding to these results differed considerably from those obtained by other workers for contemporaneous European and North American rocks, and this suggests that part of the postulated movement of India has been in relation to other continents. In all the localities, the poles corresponding to the upper rocks are nearer the present geographical poles than those from the lower flows. The discrepancy may represent a northward drift of India during the formation of the Deccan Traps, but further data are necessary. The results of detailed paleomagnetic work of this kind may in turn lead to a new method of determining the age of rocks. *Subject Headings:* **1. Paleomagnetism 2. Polar displacement 3. Magnetization of basalts 4. Deccan Traps, India.**—*Authors' abstract.*

11.5–146 550.382:551.25

Grabovskiĭ, M. A., **Magnetic properties of anisotropic rocks [and] The problem of the formation of remanence with an opposite polarity in rocks.** *Annales de Géophysique*, Paris, 15(1):119–121, Jan./March **1959.** 2 figs. French summary p. 119–121. **DLC**—In the first article, attention is drawn to anisotropic phenomena which can be presented by the magnetization of ferromagnetic stratified rocks, and on their importance for the interpretation of anomalies. In the second article, it is shown that experimental reversible magnetization is obtained by placing a sample of pyrrhotine in the middle of magnetite samples which magnetize by thermoremanence. *Subject Headings:* **1. Magnetic properties of anisotropic rocks 2. Reversible magnetization.**—*Transl. of author's abstract.*

11.5–147 550.380.8

Hannequin, Jacques, **Sur une réalisation de l'expérience de Packard et Varian.** [Performance of the Packard and Varian experiment.] *Académie des Sciences, Paris, Comptes*

Rendus, 248(7):996–998, Feb. 16, 1959. 4 figs., 2 refs. **DWB, DLC**—Measurement of the earth's magnetic field through the Packard and Varian method, in which one measures the free precession frequency of the nuclear spins of hydrogen in that field. Description of the apparatus and of its operation and results of the first experiments are given. *Subject Headings:* **1. Earth's magnetic field 2. Packard-Varian method.**—*A. V.* Ⓢ

11.5–148 551.590.24:550.384(544)

Srivastava, B. J. and Sivasankara Sastri, N. (*both, Colaba Obs., Bombay*), **On the variation in the horizontal intensity of the geomagnetic field at Phalodi (Rajasthan) during the solar eclipse of June 30, 1954.** *Indian Journal of Meteorology and Geophysics, New Delhi*, 10(1):73–84, Jan. 1959. 7 tables, 10 refs. **DWB, DLC**—Detailed analysis of hourly mean values of the horizontal force at Phalodi from 26 June to 7 July 1954, has been made with a view to isolating an eclipse-effect, if any. It is seen that 30 June 1954—the day of the eclipse—was magnetically not very calm. As such, the eclipse effects could not be disjoined from the hourly values pertaining to the eclipse period. All the bays and other big and small magnetic fluctuations (accidental or otherwise) have also been tabulated from the Phalodi H.F. magnetograms for the period 22 June to 7 July 1954, in respect of their time-extent and magnitude. The bivariate frequency table of these fluctuations is also presented. The fluctuations occurring during the period of the eclipse are studied in relation to the frequency table. Important statistical parameters of the series of the magnitudes of the fluctuations are compared with the individual fluctuations for the eclipse period and their mean. A fall of 10γ in the horizontal force, appearing 16 min. after the totality at Phalodi was a likely eclipse-effect. But when all the fluctuations occurring during the control period are studied and a picture of the accidental oscillations of the geomagnetic field is formed, it becomes difficult to say that the drop of 10γ was definitely due to the eclipse. *Subject Headings:* **1. Solar eclipse effects on geomagnetic field 2. Geomagnetic field intensity gradient 3. Phalodi, Rajasthan, India.**—*Authors' abstract.* Ⓢ

11.5–149 523.75:550.380.2

*International Scientific Radio Union, **Calendrier des phénomènes géomagnétiques et éruptions chromosphériques solaires.** [Calendar of geomagnetic phenomena and solar chromospheric eruptions.] Its *Information Bulletin* (Fr. ed.), No. 113:59–65, Jan./Feb. 1959 and No. 114:58–69, March/April 1959. Entirely tables. **DLC**—Survey of the solar chromospheric eruptions and associated geomagnetic phenomena for the year 1958. Each table contains for every day of the month: a) the solar chromospheric eruptions with indication of their importance, the time of beginning and end of the phenomena; b) the magnetic phenomena (bays; storms; huge, sudden, . . . etc., pulsations); c) the index number of the station. This index-number is that used in the transmission of information by Ursigrams. *Subject Headings:* **1. International Scientific Radio Union 2. Chromospheric eruption data 3. Geomagnetic data.**—*A. V.*

6. ZODIACAL LIGHT AND VAN ALLEN BELT

See also: **Van Allen belt** (Coulomb), 11.5–78; **Van Allen belt** (Pickering), 11.5–168.

11.5–150 523.59:551.521.326

Beckers, J. M., **The spectrum of the zodiacal light.** *Akademie van Wetenschappen te Amsterdam. Afdeeling voor de Wis- en Natuurkundige Wetenschappen, Proceedings, Ser. B, Physical Sciences*, 62(4):248–262, 1959. 6 figs., 3 tables, 18 refs. **DLC**—Hoffmeister's spectra of zodiacal light and of airglow are discussed. The appearance of the H and K lines in these spectra may be accounted for, if the zodiacal light is interpreted as sunlight scattered by stationary interplanetary dust and electrons. The temperature distribution in interplanetary space according to S. Chapman cannot explain the observations; a temperature distribution of the form $T(r) = T(1)r^{-1}$ (r being the distance to the center of the sun) is more probable. The author finds that 50% or more of the zodiacal light is due to electron scattering. From polarization observations previous authors found that 40% is due to electrons, and this fraction would be even less if Fessenkov's suggestion about the polarization of

dust-scattered light were true; on the basis of this assumption it would be difficult to reach agreement between the results of spectral observations and those of polarization measurements. *Subject Headings:* **1. Zodiacal light 2. Night airglow spectrum 3. Ion scattering 4. Polarization of dust-scattered light.**—*A. V.* Ⓢ

11.5–151 551.510.721:551.507.362.2:551.521.67

Van Allen, James A., **Radiation belts around the earth.** *Scientific American*, N. Y., 200(3):39–47, March **1959.** 11 figs. **DLC**—The discoverer of the enduring high energy radiation belts around the earth in equatorial regions gives a vivid account of the satellite data that gave the first hint of the 2 radiation belts, of subsequent improvements in instrumentation and coverage, of the equipment and records received by radio, and of the nature of these radiation belts. The inner belt reaches a peak at about 2000 mi from the earth and the outer one at about 10,000 mi, diminishing gradually until it vanishes at about 40,000 mi. Maximum intensity is 25,000 counts/sec, or 40,000 particles/sq cm/sec. The particles originate in the sun and are deflected by earth's magnetic field into corkscrew trajectories around the lines of force and are thus trapped. A heavy influx of particles causes overflow and thus auroral displays in the high latitudes. The airflow may be due to normal leakage. The Soviet physicist, S. N. VERNOV, has a different explanation, based on cosmic ray production of neutrons which eventually decay into electrons and protons which are trapped. Equipment and principles are illustrated. *Subject Headings:* **1. Radiation belt 2. Satellite discoveries.** —*M. R.* Ⓢ

11.5–152 551.510.536:551.594.12

Wentworth, R. C.; MacDonald, W. M. and Singer, S. F., (*all, Physics Dept., Maryland Univ.*), **Lifetimes of trapped auroral radiation belt particles, Pt. 1, Effect of scattering by the ionized component of the outer atmosphere.** Presented at the annual meeting, American Physical Society, N. Y., Jan. 1959. Issued as *U. S. Air Force. Cambridge Research Center, Technical Note*, TN-59-280, **1959.** 21 p. 8 figs., 2 tables, 12 refs., 30 eqs. **DWB** (M10.535 W479Li)—The existence of trapped protons and electrons in the earth's magnetic field has been discussed by SINGER in connection with a theory of magnetic storms, and has lately been demonstrated in rocket flights to altitudes of several earth radii. Once introduced into captive orbits, these particles should be strictly trapped in the earth's dipole magnetic field. However, various mechanisms exist which limit their lifetimes, such as collisions with atoms and ions in the earth's outer atmosphere, charge exchange, and scattering by hydromagnetic waves. In this paper, we consider only the effect of the scattering of these particles by the ionized hydrogen and electron components of the outer atmosphere. The Fokker-Planck equation has been used to derive an expression for the change in the distribution function due to small-angle, single particle Coulomb collisions. Upper lifetime limits, as determined by this mechanism, of both protons and electrons are derived as functions of their initial non-relativistic energies. Other mechanisms for acceleration and removal of the particles will be discussed in a later paper. *Subject Headings:* **1. Auroral particles 2. Radiation belt.**—*Authors abstract.* Ⓢ

7. RADIO ASTRONOMY

See also: **Radio astron. station, Nançay, France** (Malinge et al.), 11.5–80.

11.5–153 523.164 523.745:551.521.3 621.396

Avignon, Yvette and Pick, Monique, **Relation entre les émissions du type IV et d'autres formes d'activité solaire.** [Relationship between type IV emissions and other forms of solar activity.] *Académie des Sciences, Paris, Comptes Rendus*, 248(3):368–371, Jan. 19, **1959.** fig., table, 9 refs. **DWB, DLC**—Type IV emissions defined on metric waves are generally associated with large jumps on centimetric waves. It is shown that a slight connection exists between optical centers which give rise to type IV and centers of radioelectric storms. The frequent occurrence of two or three optical centers, giving several type IV's during the same period is also shown. *Subject Headings:* **1. Type IV solar emissions 2. Solar activity 3. Radioelectric storms.**—*A. V.* Ⓢ

11.5–154 523.164:621.396 523.75:551.521.64

Avignon, Yvette and Pick, Monique, **Relation entre les émissions solaires de rayons cosmiques et les sursauts du type IV.** [Relationship between the solar emissions of cosmic rays and the Type IV jumps.] *Académie des Sciences, Paris, Comptes Rendus*, 249(22):2276–2278, Nov. 22, **1959.** fig., 8 refs. **DWB, DLC**—A close relationship between the Type IV jumps of radioelectric radiation with intensity superior to a determined energy on the one hand, and the increase of cosmic radiation observed near the ground on the other hand, is established, taking into account the heliographic co-ordinates and the importance of the associated optical eruption. From this relationship it is inferred that an eruption probably produces cosmic rays observable near the ground when its importance is equal to 3 or 3^+ while corresponding to a jump of Type IV superior to 5 and when situated in the western part of the solar disk. The close relationship between Type IV jump and solar cosmic rays proves that the measurement of the importance of Type IV through its radiation in the field of the centimetric waves is very significant. *Subject Headings:* **1. Radio astronomy 2. Radio noise bursts 3. Solar eruption—cosmic ray relationships.**—*A. V.* Ⓢ

11.5–155 522.6:621.396

Blum, Emile-Jacques, **Aspects de la radio-astronomie après le congrès de l'URSI à Boulder.** [Aspects of radio-astronomy according to the URSI Congress at Boulder.] *L'Astronomie*, Paris, 72(6):237–245, June **1958.** 3 figs. **DLC**—Survey of the present state of radio astronomy and possibilities of future development. Review of the two fundamental problems: analytical methods, sensitivity and observations (sky and sun). Global intensity, brilliancy distribution, spectroscopy and polarization are also examined. *Subject Headings:* **1. Radio astronomy 2. Brilliancy distribution 3. Polarization.**—*A. V.*

11.5–156 621.396.633:522.2

†Blum, Emile-Jacques (*Obs. of Meudon*), **Sensibilité des radiotélescopes et récepteurs à corrélation.** [Sensitivity of correlated radio telescopes and receivers.] *Annales d'Astrophysique*, Paris, 22(2):140–163, March/April **1959.** 15 figs., 23 refs., eqs. French, English and Russian summaries p. 140. **DWB, DLC**—The sensitivity of radiotelescopes is considered, with reference to antenna and receiver characteristics. It is shown that two classes of apparatus exist: comparison and correlation radiotelescopes with essentially different properties. A discussion of these properties is followed by the description of a simple technique for making measurements by correlation. *Subject Headings:* **1. Radio telescopes 2. Sensitivity.**—*Author's abstract.* Ⓢ

11.5–157 523.75:551.521.9

Dodson, Helen W. (*McMath-Hulbert Obs., Univ. of Michigan*), **Studies at the McMath-Hulbert Observatory of radio frequency radiation at the time of solar flares.** *Institute of Radio Engineers, N. Y., Proceedings*, 46(1):149–159, Jan. **1958.** 12 figs., 4 tables, 11 refs. **DLC**—The complex flare phenomenon is described in terms of its photographic aspect of Ha spectroheliograms, associated prominence activity, terrestrial effects, and the general pattern of radio frequency emission. Flare-associated events at 2800 and 200 mc are reviewed, and the association between flares and the onset of 200-mc noise storms is discussed. Records of 2800 and 200-mc radiation at the time of 277 flares are compared. Flare-events at frequencies less than 200 mc are considered, and a study of 496 flares at 80 mc is summarized. An effort is made to compare reports of dynamic spectra at radio frequencies with flare data and single frequency records. The apparently close association between flares with "major early bursts" at frequencies $\leqslant 200$ mc and geomagnetic disturbances is discussed. *Subject Headings:* **1. Solar flare phenomena 2. Solar radio frequency radiation during flares.**—*Author's abstract.*

11.5–158 523.72:523.8:621.396.8

Kraus, John D. (*Radio Observatory, Ohio State Univ.*), **Planetary and solar radio emission at 11 meters wavelength.** *Institute of Radio Engineers, N. Y., Proceedings*, 46(1):266–274, Jan. **1958.** 12 figs., 16 refs. **DLC**—Observations are described of radio emissions from the Sun, Jupiter, and Venus during 1956 and early 1957 at a wavelength of 11 m. Records are presented of solar 11-meter radiation at the time of a large (importance 3) flare on Aug. 31,

956, and during other periods of solar activity. The effect of scintillation on records of radio stars also is illustrated. A number of records of impulsive radiation from Jupiter at both slow and fast recorder speeds is shown. Many of the short pulses consist of distinct pairs or triplets. An echo mechanism to explain the multiple pulses is postulated and observed trends in pulse separation compared to those expected with such a mechanism. The stronger Jupiter pulses indicate a peak radiated radio power at the source of the order of 10 kilowatts per cps bandwidth. Observations of 11-m radio emission from Venus are described and one record is presented for which the probability is only about one in a hundred thousand that it is due to a random process instead of Venusian radiation. *Subject Headings:* **1. Radio emission from planets 2. Solar radio radiation.**—*Author's abstract.*

11.5–159 522.6:621.396

Laffineur, M., **Radio-astronomie.** [Radio astronomy.] *L'Astronomie*, Paris, 72(5):209–214, May **1958.** 2 figs. **DLC**—Radio astronomy, science of observation of matter in the dilute state, makes a great contribution to the enlightenment of our knowledge of the Universe. In order to encourage students to take interest in this new science, the author summarizes succinctly some important points, particularly: the visual sky and the radioelectric sky, the nature of the observed radiation, the intensity of the received radiation. He illustrates his article with the telemetry of our Galaxy. The end of the article deals with galactic hydrogen and its emission on 21 cm, the Doppler-Fizeau effect and radio sources. *Subject Headings:* **1. Radio astronomy 2. Solar emissions 3. Galactic emissions 4. Radio sources.**—*A. V.*

11.5–160 523.164:621.396

Laffineur, M., **La radioastronomie.** [Radio astronomy.] *Revue Générale des Sciences Pures et Appliquées*, Paris, 66(3/4):79–86, March/April **1959. DLC**—After a short review of K. Jansky's experiments, the difference between optical astronomy and radio astronomy is pointed out as well as the advantages and disadvantages of each of these sciences. This article constitutes a synthesis of the contributions made in recent years by radio astronomy to our knowledge of the Universe. Author considers particularly the following subjects: solar emission, telemetry of our galaxy, galactic hydrogen and its emission on 21 cm, Doppler-Fizeau effect and radio sources. *Subject Heading:* **1. Radio astronomical research.**—*A. V.* Ⓢ

11.5–161 551.521.7:629.396.8

Minnis, C. M. (*D.S.I.R. Radio Research Station, Ditton Park, Slough*), **Nonuniformity in the brightness of the sun's disk during the eclipse of June 30, 1954.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 12(4):266–271, **1958.** fig., 5 tables, 7 refs. **DLC**—Previously published Norwegian and British ionospheric measurements, made during the eclipse of June 1954, showed that the solar ionizing radiation was not emitted uniformly from the whole disk. Although the brightness distributions derived from the Norwegian and British data appeared to be dissimilar, it is shown that the difference is superficial and that the underlying similarity is very close. Quantitative data for the most probable distribution are given and the results are compared with the distribution calculated from observations of solar noise radiation at 10–7 cm during the eclipse. *Subject Headings:* **1. Solar eclipses 2. Solar radio brightness.**—*Author's abstract.*

11.5–162 551.521.7:629.396.8(09)

Mirto, Giovanni, **Sorgenti radio identificabili e distinte nell' Universo.** [Identifiable and distinct galactic radio sources.] *L'Universo*, Florence, 37(2):249–254, March/April **1957.** 6 plates. **DLC**—The history of radio astronomy, and accomplishments in identifying and interpreting solar and galactic radio sources are reviewed. Photographs of some of the world's radio telescopes (Nançay, France; Florence, Italy and Agassiz Station, Harvard Observatory, U. S.) are presented. *Subject Headings:* **1. Radio sources 2. History of radio astronomy.** —*G.T.*

11.5–163 551.521.3:523.72

Whitehurst, R. N. and Mitchell, F. H. (*both, Univ. of Alabama, Univ., Ala.*), **Solar temperature and atmospheric attenuation in the 7–8 MM wavelength range.** *Institute of Radio*

Engineers, N. Y., Proceedings, 44(12):1879–1880, Dec. 1956. fig., 6 refs. **DLC**—A record showing results of a transit of sun through antenna beam of a 7.5 mm radiometer, lasting about 14 min. indicates antenna temperature of 720°K when sun is in beam. This and other tests give sun temperature = 6000 ± 500°K, and values of vertical attenuation of 0.3 to 0.6 db for weather ranging from clear to overcast with moderate rain. Solar temperatures are in keeping with those expected, but attenuation in cloudy and rainy weather is somewhat smaller than anticipated. A Dicke-type radiometer, and 18 in. paraboloidal antenna were used. *Subject Headings:* **1. Solar temperature 2. Atmospheric attenuation of 7.5 mm waves 3. Radiometer records.**—*M. R.*

8. ASTRONAUTICS, SATELLITES AND ROCKETS

See also: **IGY satellite program** (Finlay), 11.5–16; **Satellite obs. of radiation belt** (Van Allen), 11.5–151.

11.5–164 551.507.362.2:551.510.3:551.510.53

Groves, G. V. (*Dept. of Physics, Univ. College, London*), **Determination of upper-atmosphere air density and scale height from satellite observations.** *Royal Society of London, Proceedings, Ser. A*, 252(1268):16–27, Aug. 25, **1959.** 5 figs., 2 tables, 13 refs. **DWB, DLC**—A solution is obtained for the rate of change of semimajor axis and perigee distance of a satellite orbit with time due to the resistance of the atmosphere. The logarithm of air density is assumed to vary quadratically with height, and the oblateness of the atmosphere is taken into account. The calculation of perigee air density in terms of the rate of change of satellite period is dealt with; and the method is applied to data at present available on six different satellites. The variation of air density with height is obtained as

$$\ln \rho = -28.59(\pm 0.15) - (h-200)/46(\pm 5) + 0.028(\pm 0.013)(h-200)^2/(46)^2$$

for h in the range of approximately 170 to 700 km, where ρ is in grams/cm^3, h is in kilometers and standard deviations are given in brackets. *Subject Headings:* **1. Upper atmosphere density measurement techniques 2. Satellite air density measurement techniques.**—*Author's abstract.* Ⓢ

11.5–165 551.507.362.2:551.510.3:551.510.53

Groves, G. V. (*Dept. of Physics, Univ. College, London*), **Determination of upper-atmosphere air-density profile from satellite observations.** *Royal Society of London, Proceedings, Ser. A*, 252(1268):28–34, Aug. 25, **1959.** 2 figs., 4 refs., 64 eqs. **DWB, DLC**—The theory previously developed (*see* 11.5–164 above) for the changes in the perigee distance and semimajor axis of a satellite orbit due to air drag is extended to enable the air density profile (i.e. its relative variation with height) to be derived from the motion of the orbit's perigee. The solution is first obtained in terms of the change in perigee distance and then in terms of the change in the radius of the earth at the sub-perigee point. Data are analyzed by the two methods, leading to 39(±9) and 36(±15) km for the scale height in the 180 and 220 km altitude regions. *Subject Headings:* **1. Upper atmosphere density measurement techniques 2. Satellite air density measurement techniques.**—*Author's abstract.* Ⓢ

11.5–166 551.507.362.2:621.396.8:551.510.535

Vassy, E., **L'émission radioélectrique des satellites artificiels. Applications à la connaissance de l'ionosphère.** [Radio transmission from artificial satellites. Applications to the knowledge of the ionosphere.] *L'Onde Electrique*, Paris, 39(388/389):647–653, July/Aug **1959.** 8 figs., table. French and English summaries. **DLC**—The radio features of the Soviet and U. S. artificial satellites are summarized. A description is then given of investigations of the properties of the upper atmosphere based on the simple reception of a transmitted radio signal without knowledge of the code. A report is made of the methods to determine the air density of the upper atmosphere, using the Doppler-Fizeau effect, radio interferometry, the Faraday effect and refractive waves. The author comments on these various methods and shows their great utility. *Subject Headings:* **1. Upper atmosphere density measurement**

techniques 2. Radio transmissions 3. Doppler-Fizeau effects 4. Faraday effects 5. Radio interferometer techniques.—*A. V. and author's abstract.* Ⓢ

11.5–167 551.510.53:551.507.362

U. S. Air Weather Service. Climatic Center, **Survey of availability of atmospheric data above 100,000 feet from U. S. rocketsonde and satellite observations.** Washington, D. C., Aug. 1959. [35] p. Mimeo.—Answers to questionnaires sent to 24 civilian and military agencies in the U. S. regarding availability and type of upper atmosphere data from rockets and satellites up to mid 1959 are tabulated in great detail. Tabulations include replies to 30 questionnaires. Several more were excluded for security or other reasons (several agencies had more than one questionnaire or operation). The elements considered were wind, direction and speed; air density, temperature, pressure, turbulence, ion density, meteorite impacts; nightglow, ozone, magnetic, auroral, cloud, radiation, electrical and other measurements. *Subject Heading:* **1. Rocket and satellite data availability.**—*M. R.* Ⓢ

11.5–168 551.507.362.2:551.521.64

Pickering, William H. (*Calif. Inst. of Tech.*), **Some results from the Pioneer III flight.** *American Astronautical Society, Proceedings*, 1958, issued **1959.** p. 399–402. table. **DWB, DLC** (QB1.A26)—Brief comments and some data on launching and tracking of Pioneer III flight which failed to reach the moon but obtained some valuable data on the Van Allen radiation belt on its outgoing and return flights Dec. 6, 1958. *Subject Headings:* **1. Pioneer III flight (Dec. 6, 1958) 2. Radiation belt.**—*M. R.* Ⓢ

11.5–169 551.507.362.2:551.521.64

Rothwell, Pamela and McIlwain, Carl (*both, State Univ. of Iowa*), **Satellite observations of solar cosmic rays.** *Nature*, London, 184(4681):138–140, July 18, **1959.** 3 figs., table, 11 refs. **DWB**—On Aug. 16–17, 23–24, 26–27, 1958 increases in the intensity of charged particles outside the Van Allen radiation zones were detected by Explorer IV satellite 1958 epsilon, at high magnetic latitudes and rather low satellite altitudes (270–650 km). These increases are associated with the large solar flares which are measured from balloons and with riometers during the period. *Subject Headings:* **1. Satellite cosmic ray observation techniques 2. Solar flare effects on cosmic rays 3. Cosmic ray intensities.**—*N. N.* Ⓢ

11.5–170 551.508:629.19:613.693

Spilhaus, Athelstan (*Univ. of Minnesota, Dean, Inst. of Tech.*), **Assume a capability for manned space operations: for what purposes should this capability be utilized?** *U. S. Air Force. Office of Scientific Research, Vistas in Astronautics: second annual Symposium, April 1958.* pub. N. Y., Pergamon Press, **1959.** p. 142–144. **DWB** (629.1388 U581as)—Manned vehicles are most efficient near the earth or any given astronomical body and, except for studies of the behavior of man or other organisms in space and for exploration on planets or other bodies, more is to be gained by properly instrumented vehicles for studies of radiation or meteorology at great distances than from manned vehicles. *Subject Headings:* **1. Manned space observation capabilities 2. Instrumented vs. manned space vehicles.**—*M. R.* Ⓢ

11.5–171 550.38:551.510.53:551.594.12:551.507.362.2

Beard, David B. and Johnson, Francis S. (*both, Lockheed Missiles and Space Div., Palo Alto, Calif.*), **Charge and magnetic field interaction with satellites.** *Journal of Geophysical Research*, Wash., D. C., 65(1):1–7, Jan. **1960.** fig., ref., 18 eqs. **DWB, DLC**—The interaction of a satellite with the magnetic field of the earth and the ionized medium through which it is moving has been investigated. Owing to the differing incident velocities of ions and electrons and therefore differing incident flux intensities, a negative potential will be induced on the satellite, but it is smaller than has previously been believed. Satellite motion across the magnetic lines of the earth will induce a voltage on the satellite of as much as 0.2 volt per meter of satellite size, and this may affect the interpretation of measurements of satellite potential. The magnetic drag resulting from the induced currents is proportional to the cube of the

satellite dimensions and may exceed the mass drag for satellites larger than 50 m in diameter this can occur only above 1200 km altitude, where the charge density exceeds the neutral density. Thus the magnetically induced current is an insignificant cause of drag. Although some useful power can be extracted from the induced current, it is not a very promising source of auxiliary power for presently conceived vehicles. *Subject Headings:* **1. Satellite-magnetic field relationships 2. Atmospheric drag.**—*Authors' abstract.* Ⓢ

11.5–172 551.507.362.2:531.5

Arnold, Kurt (*Geod. Inst. Germ. Acad. Sci. Berlin*), **Die Bewegung der Knotenlinie einer Satellitenbahnebene auf Grund der Schwereanomalien.** [Movement of the modal line of a satellite trajectory on the basis of gravity anomalies.] *Beiträge zur Geophysik*, Leipzig, 68(4):193–203, **1959.** table, 12 refs., 20 eqs. German and English summaries p. 193. **DWB, DLC**—Regarding the determination of the flattening of the best-fitting earth-ellipsoid by the observation of artificial earth-satellites it is necessary to introduce the spherical harmonics of fourth and higher order in the development of the gravity anomalies. Their influence is not without importance. *Subject Headings:* **1. Satellite trajectories 2. Gravity anomalies.**—*Author's abstract.* Ⓢ

11.5–173 551.507.362.2:551.510.53

Nonweiler, T. (*Queen's Univ. Belfast, N. Ireland*), **The motion of an earth satellite on re-entry to the atmosphere.** *Astronautica Acta*, Vienna, 5(1):40–62, **1959.** 13 figs., 4 tables, 34 eqs. English, German and French summaries p. 40. **DWB.** Also in: *International Astronautical Congress, Amsterdam, Aug. 1958, Proceedings of the Ninth Congress*, Vol. 2: 842–864, issued **1959.** 13 figs., 4 tables, 34 eqs. English, French and German summaries. **DLC** (TL787.I44)—The equations of motion of a satellite have been solved by an approximate method relevant to that part of its re-entry into the atmosphere where aerodynamic forces predominate. It is found that the motion is relatively insensitive to the form of orbit which the satellite has been describing beforehand, provided only that it has described a sufficiently large number of circuits. Likewise it is found that the retardation suffered is practically independent of the size, shape and weight of the satellite which factors merely determine at what height the retardation occurs. Some deductions are made concerning the intensity of frictional heating in the descent, and full details of the characteristics of the motion are tabulated. *Subject Headings:* **1. Satellite re-entry into the atmosphere 2. Satellite retardation.**—*Author's abstract.* Ⓢ

11.5–174 551.507.362.2(759)

Fourth US-IGY satellite. *American Geophysical Union, Transactions*, 39(5):1002–1003, Oct. **1958.** fig. **DWB, DLC**—The 1958 Epsilon, the 4th US-IGY satellite, was launched from Cape Canaveral on July 26, 1958. This report gives the satellite characteristics, tracking, orbit and the early results. *Subject Headings:* **1. U. S. satellites 2. Cape Canaveral, Fla.**—*N.N.*

11.5–175 551.507.362.1:523.7

Friedman, Herbert (*U. S. Naval Res. Lab., Wash., D. C.*), **Rocket astronomy.** *American Astronautical Society, Proceedings*, 1958, issued **1959.** p. 388–392. 5 photos. **DWB** (629.1388), **DLC** (QB1.A26)—A brief summary, with action photos, of NRL rocket program during the Oct. 12, 1958 eclipse expedition to the Danger Island region of the South Pacific. The most important contribution of rocket astronomy is the charting of the solar spectrum in the UV (300–1300 Å) and X-ray (20 to 100 Å) portion (which is responsible for the ionospheric layers) which comes from the sun's corona. The first four rockets reached 139, 148, 152 and 150 mi, respectively; the first before second contact, the second and third at 1 min intervals during totality and the fourth, 5 minutes after third contact. The UV radiation almost disappeared a few seconds after totality, but the X-ray flux remained at a fairly high level. *Subject Headings:* **1. Rocket astronomy 2. IGY eclipse expedition, Danger Islands (Oct. 12, 1958) 3. Rocket launchings—Danger Islands, South Pacific.**—*M.R.* Ⓢ

11.5–176 551.507.362.1 :523.872

Friedman, Herbert, **Rocket astronomy.** *Scientific American*, N. Y., 200(6):52–59, June 1959. figs., photos. **DWB, DLC**—A survey of knowledge of the universe gained from rocket flights above the filter of the earth's atmosphere. For instance, large areas of ultraviolet radiation have been charted in several constellations (as shown in illustrations). Firing of 6 rockets from the USS "Point Defiance" on Oct. 12, 1958 during Pacific Eclipse is shown in 6 photographs. Windows in the atmosphere admitting electromagnetic radiation are indicated on model of spectrum from .001 A to 1000 km and actual ultraviolet spectrum made from NRL Aerobee at 123 mi on March 13, 1959 (from 500 to 1800 A) shows vividly 100 ultraviolet emission lines. Also ultraviolet photos of sun made the same day are reproduced and discussed. Techniques used and some of the consequences of solar and stellar emissions in ultraviolet are also explained. *Subject Headings:* **1. Rocket astronomy 2. Ultraviolet emissions from stars. I. U. S. Naval Research Laboratory II. Tousey, Richard.**—*M. R.* Ⓢ

11.5–177 551.507.362.1

Webb, Willis L. and Jenkins, Kenneth R. (*both, White Sands Missile Range, New Mexico*), **Application of meteorological rocket systems.** *Journal of Geophysical Research*, Wash., D. C., 64(11):1855–1861, Nov. 1959. 10 figs., 13 refs. **DLC**—A series of test rocket firings has been conducted during the past 18 months to establish the operational feasibility of numerous rocket systems for meteorological observations. As might be expected, the most desirable systems from the point of view of instrumentation are generally not the most desirable from that of the rocket-firing problem. It has been demonstrated, however, that a reasonable observation schedule can be accomplished by the judicious application of currently available rockets and sensors. The most variable of high atmosphere meteorological parameters is the wind. Chaff was used initially for rocket wind measurements because it could be expected to provide a suitable indication of the wind in the atmosphere above balloon sounding levels. It is easy to package and deploy. Most of the available high atmosphere wind data have been obtained through use of a chaff sensor, and it is still most applicable for point measurements wind and at very high altitudes. The need for a more coherent sensor and a vehicle capable of transporting a telemetry system to provide for the measurement of other parameters has resulted in the development of a parachute system. Although an altitude range problem will always be encountered, it is possible to obtain data from approximately 200,000 ft to the surface through the application of a single parachute and balloon combination. Launch and flight characteristics of the tested rockets are presented for use in applying this new observational technique. Careful adherence to the design and operational restrictions indicated by these data will result in savings in the effort required for development of the various desirable measuring techniques. Experience to date indicates that it is possible, with available equipment and a reasonable expenditure of effort, to obtain profiles of several meteorological parameters from the surface to altitudes of the order of 200,000 ft. *Subject Heading:* **1. Rocket exploration of the upper atmosphere.**—*Authors' abstract.* Ⓢ

11.5–178 551.507.362.1 :551.594.12 :662.2 :539.1

Allen, Lew, Jr.; Beavers, James L., II, and Whitaker, William A. et al. (*all, Air Res. Dev. Center, Kirkland A. F. Base, New Mexico*), **Project Jason measurement of trapped electrons from a nuclear device by sounding rockets.** *Journal of Geophysical Research*, Wash., D. C., 64(8):893–907, Aug. 1959. 16 figs., 2 tables. "These remarks, and other papers at Symposium to be published in Aug. 1959 issue of Proceedings of the National Academy of sciences." **DLC**—Solid-propellant rockets were sent to altitudes of 800 km from three stations in the eastern U. S. to observe electrons injected into the geomagnetic field from a small high-altitude nuclear detonation. The electron flux was measured by an assembly of Geiger counters. Shortly after a nuclear detonation above the South Atlantic, a narrow region of high counting rate was observed. The geometry of the observations is related to the geomagnetic field. The region consisted of an intense band about 20 km wide (half-width at half maximum counting rate) and less intense wings extending at least 700 km north and perhaps 700 km south of the band. Neither position nor width of the band changed during the observations, which consisted of periodic soundings until 100 hr after the nuclear detonation. The intensity of both the wings and the band decayed during the measurements as $1/t$, which is consistent

with the hypothesis that small-angle scattering is the dominant loss mechanism. The angul distribution of the radiation was measured, and the electron flux was observed to be confin very nearly to a plane perpendicular to the field lines. Spectral measurements show far few electrons above 4 Mev than were expected from the fission beta spectrum. Betas trapp from the decay of neutrons emitted from large-yield high-altitude weapon tests in the Paci were also noted. *Subject Headings:* **1. Nuclear explosion effects in upper atmosphe 2. Rocket measurement of trapped electrons 3. Upper atmosphere research method I. Welch, Jasper A., Jr. II. Walton, Roddy B.**—*Authors' abstract.* Ⓢ

11.5–179 621.396.946:621.317

Boyd, R. L. F. (*Dept. of Physics, Univ. College London*), **Electronic instruments in spac research vehicles.** *Institution of Electrical Engineers, London, Journal,* 5(56):457–463, Au **1959.** 6 figs., table. **DLC**—The most important of the special environmental conditions f electronic instruments in satellites is temperature. This is closely followed in significance b vibration and acceleration hazards and by weightlessness. None of these conditions is no mally serious for miniature equipment. Miniaturization is as important in connection wi power saving and strength as in space and weight economy. The provision of electrical pow is a major, if not limiting problem for much satellite experimentation. Types of power sour available are discussed, as is the ancillary equipment normally required in space vehicles f data recovery, position determination, time-keeping and so on. Also briefly mentioned a the many types of sensing device with which basic measurements are made. *Subject Heading* **1. Electronic equipment 2. Satellite instrumentation.**—*Author's summary.* Ⓢ

11.5–180 551.507.362

McGuire, Frank G., **Weather satellite will have three cameras.** *Missiles and Rocket* Wash., D. C., 5(9):17–18, March 2, **1959.** 2 photos. **DWB**—The U. S. Government a nounced that a satellite containing three television cameras will be launched into orbit in th first of a series of such meteorological experiments under the sponsorship of ARPA, and tha later meteorological experiments will be the responsibility of the Weather Bureau Sectio *Subject Heading:* **1. Satellite television observation techniques.**—*N.N.* Ⓢ

11.5–181 551.507.362.2:621.39

Berkner, L. V. (*Pres., Assoc. Universities, Inc., N. Y.*), **IRE enters space.** *Institute Radio Engineers, N. Y., Proceedings,* 47(6):1048–1052, June **1959.** 2 refs. **DWB**—Man escape from the confines of his planet offers him revolutionary opportunities for performin whole new ranges of scientific experiments, notably in such fields as astronomy, physics an geophysics. Electronics, because it provides the vital nerve system for such experiment will be at the very center of these new exploits in space. Moreover, earth satellites, possibly i a 24-hr equatorial orbit, promise to open a new era in global communications in which almo limitless bandwidths may become available at relatively low cost. Space will become a majo part of the activities of the IRE and its members in the future. Already there is developin a need for international planning of space-age communications standards and of regulatio for utilizing satellites for man's greatest benefit. *Subject Headings:* **1. Satellite communicatio 2. Satellite uses.**—*Author's abstract.* Ⓢ

11.5–182 551.507.362.2:612.014

Mayo, Alfred M. (*Douglas Aircraft Corp., El Segundo Div.*), **How to get the most out man in space.** *Space Aeronautics Research and Development Hand Book,* Vol. 3, 1959/196 issued **1959.** p. K-5 to K-9. 6 figs. **DWB**—General scheme of the man-machine syste is presented graphically and described. Human acceleration tolerances, tolerable deceleratio distance for various speeds and altitudes (0–10,000 mi and mach 1–100), regenerative air-foo water cycle, radiant heating and cooling systems, radiation dosages and tolerances (0 to 120,00 ft), meteoroid penetration depths and hit probability, radiation dosage in Van Allen belt human response to noise and vibration, and miscellaneous biophysical parameters in a satellit environment are presented in graphs and tables. *Subject Headings:* **1. Satellite biophysi 2. Satellite environmental data.**—*M.R.* Ⓢ

E. SOLID EARTH GEOPHYSICS

1. GEOPHYSICS

See also: **Geophysical conf.** (Gaevskaia), 11.5-28; **Gravity anomalies and satellite trajectories** (Arnold), 11.5–172.

11.5–183 55(47)

Sovetskaia geofizika k sorokaletiiu Velikoĭ Oktiabr'skoĭ sotsialisticheskoĭ revoliutsii. [Soviet geophysics on the 40th anniversary of the Great October Socialist Revolution.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 11:1313–1322, **1957. DWB.** Transl. into English in corresponding issue of the English language edition, issued by American Geophysical Union, **Bulletin of the Academy of Sciences of the USSR, Geophysics Ser.**—The author summarizes the expanded development of the geophysics services in the U.S.S.R. since the October Revolution. The greater scope of geophysics under the Soviet as compared with the tzarist regime and the role of geophysical services in the economic development of the U.S.S.R. are stressed. In 1921 LENIN signed decrees organizing the meteorological service of the U.S.S.R. and the Floating Marine Scientific Institute for investigating the northern seas. The State Hydrological Institute was organized in 1919. In connection with attempts to replace statistical empirical methods in the study of the atmosphere, seas and oceans, and the continents, fundamental concepts of dynamic meteorology and oceanography were developed (KOCHIN, SHULEĬKEN, etc.). The Institute of Seismology of the Academy of Sciences was the first institute for general geophysics to be established. During the thirties expeditions were organized to map the magnetic gravitational fields of the U.S.S.R., to study the meteorology, hydrology, etc. of the northern seas and, in connection with the Second Geophysical Year, studies were carried out in the upper atmosphere with the aid of the Molchanov radiosonde. Three new institutes were organized in 1956 on the basis of the Institute of Geophysics, namely; Institute of Physics of the Earth, Institute of Atmospheric Physics, and Institute of Applied Geophysics. The present extent of geophysics in the studies in the U.S.S.R. and the scientific attainments of Soviet scientists in the following fields of geophysics are summarized: studies in the solid earth, atmospheric physics, physics of the seas, physics of channel flow, and exploration geophysics. *Subject Headings:* **1. Soviet geophysics 2. History of geophysics research 3. U.S.S.R.**—*I.L.D.*

11.5–184 550.37

Baronov, V. and Kunetz, G., **Distribution du potentiel dans un milieu stratifié.** [Distribution of the potential in a stratified medium.] *Académie des Sciences, Paris, Comptes Rendus*, 247(23):2170–2171, Dec. 10, **1958.** 4 refs., 8 eqs. **DWB, DLC**—Study of the electric field created in the subsoil by a continuous current, injected through a pin-point connection at the surface. The author shows that the problem of electric potential intervening in applied geophysics is limited to the study of a propagation equation. *Subject Headings:* **1. Applied geophysics 2. Electric field in subsoils 3. Electric potential.**—*A.V.*

11.5–185 550.3(08)

American Museum of Natural History, N. Y. Hayden Planetarium, **Earth, air and space: Symposium on the International Geophysical Year, Sept. 12, 1957.** Franklyn M. Branley, editor. Its *Contributions, Ser. 1*, No. 1, **1958.** 37 p. figs., and photos. (All articles abstracted separately.) **DWB** (551 A512co)—Symposium consisted of talks by Joseph Kaplan on the **U. S. IGY program,** Walter Orr Roberts on **Sun-earth relationships,** RICHARD W. PORTER on **Rocket and satellite programs,** John A. Simpson on **Cosmic radiation and geomagnetism,** ROBERT A. HELLIWELL on the **Upper atmosphere,** and Farrington Daniels on **Atmospheric, oceanic and geochemistry and use of solar energy**—all in relation to the IGY program. *Subject Headings:* **1. Geophysical symposia 2. IGY symposium. I. Branley, Franklyn M.** (*ed.*). —*M.R.*

11.5–186 552.1:546.264

Lang, Walter B. (*U. S. Geological Survey*), **The origin of some natural carbon dioxide gases.** *Journal of Geophysical Research, Wash., D. C.*, 64(1):127–131, Jan. **1959.** 3 tables, 18 refs.

DLC—Natural carbon dioxide gas issues from vents and springs in sedimentary rocks. I ploratory wells drilled for oil have produced large volumes of carbon dioxide in subsurfa Where these gases are found in quantity, limestones and igneous rocks are in close associati and the origin of the gases is thus suggested. Until the advent of the mass spectrome there was no means to investigate this problem. Gas samples were taken from representati areas and the analyses showed that the gases were derived from limestone. The isotop ratios did not give evidence of fractionation. *Subject Headings:* **1. Carbon dioxide in roc 2. Mass spectrometer analysis.**—*Author's abstract.*

11.5–187 551.24:551.312.4 551.35

Oulianoff, Nicolas, **Gisements d'eau fossile dans la croûte terrestre.** [Fossil-water fiel in the earth's crust.] *Académie des Sciences, Paris, Comptes Rendus*, 248(19):2782–27 May 11, **1959.** 8 refs. **DWB, DLC**—In the classification of water running within the eart crust, hydrologists for a long time accepted only meteoric water and water originating fr condensation in the water vapor of the subterranean atmosphere. The categories of juven water issuing from the efflux of eruptive mountain masses and fossil-water, or dehydrati waters coming from the rocks themselves, were considered later on. Author examines t problem of "fossil-water" retention within the earth's crust. The result of an experiment ma in laboratory suggests the idea that the perpetual vibration of the earth's crust promotes t forming of "fossil-water" pockets. *Subject Headings:* **1. Hydrology 2. Fossil water retenti 3. Earth's crust vibration.**—*A. V.*

2. GEODESY

11.5–188 91.04:526.8(9

†Gvozdetskiĭ, Nikolaĭ Andreevich, **Sorok let issledovaniĭ i otkrytiĭ.** [Forty years investigations and discoveries.] Moscow, Gosud. Izdatvo Geograficheskoĭ Lit-ry, **195** 207 p. figs., numerous ports., 192+184 refs. **DWB** (910 G993so)—Account of investigatic and explorations in geography and cartography in the central Arctic and Asiatic sub-Arc from 1918–1957. Special expeditions to the Taimyr Peninsula, the Indigirka Basin, Al Mountains, Caucasus, Nova Zemlya, Kara Sea, Arctic Islands, Lomonosov Range in Cent Arctic, Kolyma Basin, Far East and Central Asia, are discussed in separate chapters. *Subj Headings:* **1. Cartographic expeditions 2. Arctic Basin 3. Siberia.**—*M. R.*

11.5–189 551.321:326 551.32

Hofmann, Walther (*Munich*), **Mesures géodésiques pour l'analyse relative du co portement d'un glacier.** [Geodetic measurements for the relative analysis of glacier behavio (In: I.U.G.G. Association of Scientific Hydrology, **Symposium de Chamonix, Sept. 1958,** pu Gentbrugge, **1958.** p. 13. ref.) **DWB** (551.311 I611sy)—The behavior of Nisqually Glaci (Mt. Rainier) is analyzed on the basis of measurements from 1952–1956 using a geometri method. Photogrammetric surveys of ice movement along a transverse profile on the glac tongue indicated that surface velocity has increased by 38.7% and the ice surface at the pro has risen an average of 11 m. Discharge through the profile was estimated to have increas by 47%, assuming a constant increase in ice velocity in the total cross section of the profi In order for the glacier to have remained stationary, the increase in discharge should ha been compensated by a similar increase in ablation below the profile measured. A comparis of topographic surveys in 1952 and 1956 showed that the surface of the glacier below t measured profile has increased by 53%, indicating that the glacier had exceeded the stationa condition by about 6%. *Subject Headings:* **1. Glacier movement 2. Photogrammetric glac surveying 3. Mount Rainier, Washington.**—*SIPRE* 17359.

11.5–190 538.3:531.

Loiseau, Jean, **L'explication rationnelle du champ gravifique et du champ électromagné que (Conférence faite au Palais de la Découverte le 20 novembre 1954),** [A rational explanati of the gravity and the electromagnetic fields (Conference held at the Palais de la Découver Nov. 20, 1954).] Paris, Université, **1955.** 17 p. figs. *Les Conférences du Palais de Découverte, Sér. A*, No. 200. **DLC** (QC178.L85)—A lecture giving the author's ideas on t physical nature of the fields of gravity and of magnetism, based on the idea of acceleratio

pirical knowledge is incorporated with the theoretical. *Subject Heading:* 1. Electro-gnetic-gravity fields.—*M.R.*

3. GEOTHERMY AND VOLCANOLOGY

11.5–191 551.21(675)

de Magnée, I. **Première exploration géophysique du volcan Nyiragongo (Kivu).** [First physical reconnaissance of the Nyiragongo volcano (Kivu).] *Belgium. Académie Royale Sciences Coloniales, Bulletin des Séances*, N.S., 5(2):379–401, **1959.** 12 refs. **DWB**—view of the various volcanological researches made on the Congolese volcanoes in the large tonic rift-valley in Central Africa. Investigations concern principally chemical and neralogical composition of lavas. Geophysical measurements have also been made. For purpose of the IGY, Belgium (Institut de Recherches Scientifiques en Afrique Centrale) w up a program for geophysical study of the Nyiragongo volcano (Kivu). The author s the leader of the expedition, which involved going down into the crater of the volcano at the er level. First scientific results gathered through measurements made during the expedition given. They concern the temperatures of the lava lake; they oscillate between 1050° and 5°C. An attempt is made to interpret the kinematics of the lava lake (horizontal motion l vertical oscillations) and comments are given on spectroscopic measurements of the volcanic nes, magnetic and seismological measurements, measurements of the radioactivity and asurements made on geological samples. The author gives a short account of the programs ablished for succeeding missions. *Subject Headings:* 1. Volcanology 2. Nyiragongo volcano, lgian Congo 3. Belgian participation in IGY 4. IGY volcanology program.—*A.V.*

11.5–192 550.31

Lovering, J. F., **The nature of the Mohorovicic discontinuity.** *American Geophysical nion, Transactions*, 39(5):947–955, Oct. **1958.** 3 figs., 2 tables, 34 refs., 2 eqs. [**Discussion**] **Hisashi Kuno** [**and Reply by**] **Lovering.** *Ibid.*, 64(8):1071–1073, Aug. **1959.** 9 refs. **DWB, DLC**—New evidence for the composition of the silicate mantle of the primary teorite body suggests that a considerable portion of the Earth's upper mantle may well be nposed of silicate material of basaltic composition. Consequently the Mohorovicic dis-ntinuity may not separate basaltic crustal from ultrabasic uppermantle material but rather rk a zone in which basaltic material is transforming into a high-pressure modification ssibly represented by the rock-type eclogite. Estimates of the temperatures and pressures the average levels of the Mohorovicic discontinuity under oceans and continents give two ints on the 'equilibrium line' for the transformation basalt→eclogite which is roughly given the relationship $p = 21.8\theta - 488$ (p in bars, θ in °C). The geophysical consequences of this pothesis are far reaching. It removes difficulties arising from the observed equivalence of eanic and continental heat flows, provides satisfactory 'parent magma' from which the anitic and basaltic zones in the crust have differentiated, and suggests a mechanism for vating or depressing regions of the Earth's surface simply by increasing or decreasing the mperature at the level of the Mohorovicic discontinuity beneath that region. *Subject adings:* 1. Mohorovicic discontinuity 2. Ocean bottom mantle 3. Geothermy.—*Author's stract.*

11.5–193 551.1

Lubimova, H. A., **Thermal history of the earth with consideration of the variable thermal nductivity of its mantle.** *Geophysical Journal*, London, 1(2):115–134, June **1958.** 8 figs., refs., 8 eqs. **DWB**—Data about the abundance of the radioactive elements and the thermal nductivity of the Earth are in favor of the view that its initial temperature $T_0(r)$ must have en below the melting temperature. The results of the calculations of $T_0(r)$ are presented the Earth considered as being formed through accumulation of particles of a gas-dust otoplanetary cloud. The redistribution of radioactive elements is considered from uniform stribution to a layered one. The matter of the mantle is considered as a dielectric possessing t only molecular conductivity but a radiative transfer of heat in the high temperature range. he Green's function method and hydraulic analogy method are used for the calculations of the lution of the thermal conductivity equation. It is shown that the increase of effective

thermal conductivity due to a radiative transfer of energy at a great depth does not prodi any essential losses of inner heat. The thermal conductivity of the Earth's upper layers largely determined by its molecular component decreasing as the temperature rises and there forbidding considerable losses of inner heat. That leads to the conclusion that the Eart thermal history may be regarded as secular heating of its interior with simultaneous sli cooling of its outer layers. *Subject Headings:* **1. Thermal conductivity of earth's man 2. Earth's mantle.**—*Author's abstract.*

4. SEISMOLOGY

See also: **Tsunamis** (Yoshida), 11.5–205.

11.5–194 551.2

Jobert, G. (*Inst. de Physique du Globe de l'Univ. de Paris*), **Étude du mouvement du au voisinage d'une faille.** [Study of the movement of the soil in the vicinity of a faul *Geofisica Pura e Applicata*, Milan, 43:75–82, May/Aug. **1959.** 2 tables, 3 refs., eqs. Engl and Esperanto summaries p. 75. **DWB, DLC**—The scheme of a seism caused by the slippi of a transcurrent fault is examined and the law of the variation of the seismic superficial c placement vs. distance to the fault is given, assuming that no extra stress is produced at t base of the broken layer. Taking a simple example for the preseismical strain, it is possi to find an order of magnitude of the extent of the fault in depth. An application to the S Francisco seism of 1906 gives a depth of about 13 km. *Subject Heading:* **1. Seismic faults** *Author's abstract.*

11.5–195 550.340.19:621.3

Rocard, Y., (*Ecole Normale Supérieure, Paris*), **L'amplification électronique et les séism graphes.** [Electronic amplification and seismographs.] *Annales de Géophysique*, Par 15(3):418–421, July/Sept. **1959.** ref. **DLC**—Examination of the possibilities of long a short period seismographs and study of the sensitivity of large amplification instrumen The advantages of using transistors are mentioned. The author investigates the limitation amplification resulting from the ground noise of valves and circuits, and that resulting from t heating of the moving parts. Since contrast with earth foundation noise is the major cause the limitation of perceptible signals, the use of transistors makes is possible to build seism graph enlargers of the same strength as apparatus with electronic tubes. *Subject Headi* **1. Seismographs.**—*A. V.*

11.5–196 550.34(5

Tandon, A. N. (*Cent. Seismological Observ., Shillon*), **The Rann of Cutch earthquake July 21, 1956.** *Indian Journal of Meteorology and Geophysics*, Delhi, 10(2):137–146, Ap **1959.** fig., 4 tables, 6 refs., 3 eqs. **DWB, DLC**—A seismometric study of the earthquake 21 July 1956 in the Rann of Cutch, which caused destruction to life and property at Anj has been made. The epicenter and origin time have been determined by the method of le squares and are lat. 23°20′N, long. 70°00′E and $15^h\ 32^m\ 26^s$ G.M.T., respectively. The sh had a magnitude of 7 and a depth of focus of nearly 13 to 18 km. *Subject Headings:* **1. Ear quakes 2. Rann of Cutch, India.**—*Author's abstract.*

F. OCEANOGRAPHY, HYDROLOGY AND GLACIOLOGY

1. OCEANOGRAPHY

See also: **Marine ecology** (Moore), **11.5–3.**

11.5–197 551.46(262.5,26

*†Datsko, Vasiliĭ Gordeevich, **Organicheskoe veshchestvo v vodakh iuzhnykh morei SS** [Organic matter in the water of the southern seas of the U.S.S.R.] Moscow, Akade Nauk SSSR, **1959.** 270 p. 5 figs., 93 tables, 265 refs. **DLC** (GC116.D3)—A thorough systematic review of all available knowledge on organic matter in ocean water, especiall

Black and Caspian Seas; methods of determination of total amount of organic matter of bonates, nitrates, phosphates, acidity, rate of production of organic matter; distribution of anic matter in phytoplankton, bacteria, zooplankton, phytobenthos, zoobenthos and fish; specific content of the Azov Sea, the Black Sea and the Caspian Sea (in great detail for h). Incidentally, the river runoff and water exchange of these 3 seas are discussed as back-und for the discussion of the balance of organic substances. The volume is full of detailed ular data and a number of charts showing, for example, the diurnal variation in organic ments in the Black Sea. *Subject Headings:* **1. Marine hydrochemistry textbooks 2. Water ance of Soviet seas 3. Black Sea 4. Caspian Sea 5. Azov Sea.**—*M.R.*

11.5–198 551.46:91.04

Riccardi, Riccardo, **La Spedizione Oceanografica Danese della "Galathea."** [The nish Oceanographic Expedition in the "Galathea."] *Società Geografica Italiana, Bollettino*, 8, 11(9/10):479–489, Sept./Oct. **1958.** English summary p. 489. **DWB, DLC**—This icle summarizes the general scientific results reached by the great Danish oceanographic edition of "Galathea," which circumnavigated the world in 1950–1952. The route taken the ship is briefly described, dwelling particularly on data obtained relating to salt and gen content and temperature of water, and their productivity, to the fauna of the depths to Rennell (one of the Solomon isles) and Campbell Islands (south of New Zealand), ich were all carefully explored. *Subject Headings:* **1. "Galathea" Expedition, 1950–1952 Oceanographic expeditions.**—*Author's summary.*

11.5–199 551.465:551.506.22(45)

Bossolasco, Mario, **Ricerche talassografiche italiane per l'Anno Geofisico Internazio-le 1957–58: libertà di discussione scientifica o dittatura integrale?** [Italian oceano-aphic research for IGY 1957–1958: freedom of scientific discussion or absolute dictatorship?] *ofisica e Meteorologia*, Genoa, 7(1/2):50–52, Jan./April **1959.** 6 refs. English summary 52. **DWB**—Contrary to the program predisposed for the cruises made in the Italian seas ring the IGY 1957–58, the author confirms that it is generally impossible to deduce in-ectly the mass-currents in the same seas based on the Bjerknes theorem, without some ect measurements of the current velocity, simultaneously with those of temperature and inity. *Subject Headings:* **1. IGY oceanography program 2. Italian participation in IGY.** *Author's abstract.*

11.5–200 551.461.2:551.542.1:551.552

Reid, Robert O. (*Dept. Oceanography and Meteor. Texas A & M.*), **Effect of Coriolis force edge waves, Pt. 1, Investigation of the normal modes.** *Journal of Marine Research*, New aven, Conn., 16(2):109–144, Aug. **1958.** 5 figs., 6 tables, 12 refs., 104 eqs. **DWB, DLC**—ssentially two classes of free edge waves can exist on a sloping continental shelf in the presence Coriolis force. For small longshore wave length, fundamental waves of the first class behave e Stokes edge waves. However, for great wave lengths (of several hundred kilometers or ore) the characteristics of the first class are significantly altered. In the Northern Hemi-here the phase speed for waves moving to the right (facing shore from the sea) exceeds the eed for waves which move to the left. Also, the group velocity for a given edge wave mode s a finite upper limit. Waves of the second class are essentially quasigeostrophic boundary aves with very low frequency and, like Kelvin waves, move only to the left (again facing ore from the sea). Unlike Stokes edge waves, those of the quasigeostrophic class are asso-ated with large vorticity. Examination of the formal solution for forced edge waves indicates at those of the second class may be excited significantly by a wind stress vortex. Also, in ntrast to the conclusion of GREENSPAN (1956), it is proposed that a hurricane can effectively cite the higher order edge waves modes in addition to the fundamental if wind stress is nsidered. *Subject Headings:* **1. Edge waves 2. Coriolis force-edge wave relationships.**—*uthor's abstract.*

11.5–201 551.461.2:551.542.1:551.552

Kajiura, Kinjiro (*Dept. Oceanog. and Met., Texas A & M*), **Effect of Coriolis force on edge aves, Pt. 2, Specific examples of free and forced waves.** *Journal of Marine Research*, New

Haven, Conn., 16(2):145–157, Aug. **1958.** 3 figs., 2 tables, 4 refs., 26 eqs. **DWB, DL** Modification of edge waves due to Coriolis force is examined in terms of two specific proble dispersion of an initial deformation of the water surface; the forced wave due to a mov atmospheric pressure disturbance. In both cases the scale of the disturbance is an import factor, and the larger the scale the larger the effect of Coriolis force. In the Northern He sphere, the initial deformation of the water surface is split into two free edge waves in wh the one moving to the left (facing the coast from the sea) has a larger amplitude than t moving to the right. The contribution of Coriolis force to the edge wave amplitude fo initial deformation having a horizontal scale of several hundred kilometers is about 20% at center in the initial stage. In the case of forced waves, movement of the atmospheric press system to the left is more favorable for exciting resurgent edge waves than movement to right. The contribution of Coriolis force is about 10 to 20% in the forced period and 20 to 4 in the amplitude for an atmospheric disturbance of several hundred kilometers in diam which moves with a speed of about 20 to 30 kn. *Subject Headings:* **1. Edge waves 2. Cori force-edge wave relationships.**—*Author's abstract.*

11.5–202 532.7 532.59:551.46

Roseau, Maurice, **Sur un problème de diffusion d'ondes liquides.** [A problem of liq wave diffusion.] *Académie des Sciences, Paris, Comptes Rendus,* 249(16):1453–1455, Oct. **1959.** ref. **DWB, DLC**—Theoretical study of the diffusion, within a permeable solid medi of hydrodynamic waves sustained through oscillations of the horizontal water plane of ocean on a shore sloping with an angle $\alpha(\alpha \leq n/2)$ on the horizon. Author gives an exp presentation of the solution to this problem for every value of α, $0 < \alpha < n/2$. *Subject Headi* **1. Diffusion theories 2. Hydrodynamic waves 3. Water surface oscillations.**—*A. V.*

11.5–203 551.556.8:551.465:532

†*Walden, Hans, **Die winderzeugten Meereswellen, Teil 1, Beobachtungen des Seegan und Ermittlung der Windsee aus den Windverhältnissen.** [Wind induced waves, Part Observations on the state of the sea and determination of wind generated sea from w conditions.] *Hamburg. Seewetteramt, Einzelveröffentlichungen,* No. 18, **1957.** 2 vol. Vol Text. 40 p. 4 tables, 21 refs. Vol. 2, Entirely figures (some fold., some in pocket). **DWI** A very detailed treatment on observation and forecasting the state of the sea is present Under each of the following main subject headings various characteristics are consider (I) Observation of sea waves, (II) Properties of the wind generated sea, (III) Calculatio the wind generated sea from localized fetch. The discussion and the accompanying graph presentation are in separate volumes. *Subject Headings:* **1. Wind-wave relationships 2. Oc wave observation.**—*W. N.*

11.5–204 532.953:551.

Yamada, Hikoji, **On the approximate expression of Stokes waves.** *Fukuoka, Jap Kyushu Univ. Research Institute for Applied Mechanics, Reports,* 5(20):143–155, 19 5 figs., 5 tables, 4 refs., 31 eqs.—The approximate solution due to T. V. Davies (his approximation being very simple and integrable) is examined and proved to be a good appr mation for almost all the range of steepness. For this purpose two accurate solutions, on the highest amplitude and the other of the steepness 0.0827, are calculated and in compari with these the degree of approximation is decided. *Subject Heading:* **1. Wave height esti tions.**—*Author's abstract.*

11.5–205 532.593:55

Yoshida, Kozo (*Tokyo Univ. Geophys. Inst.*), **A hypothesis on transmission of energ tsunami waves.** *Records of Oceanographic Works in Japan,* Tokyo, n.s., 5(1):14–37, **1959.** 6 figs., 2 tables, 3 refs., 38 eqs. **DWB**—Tsunami wave records usually reveal charac istic shape of envelope which, in a statistical sense, appears to depend only upon the tra distance of the tsunami at the station. Somewhat more detailed analysis of the records revealed that such envelope characteristic differs materially between the records at oce stations (in midocean areas) and at continental stations (along the coasts of continents).

e interval between the arrival of the first wave and that of the highest wave (or the mean val time of the portion containing the maximum energy) is found to increase linearly with travel distances. This relationship is examined for a few cases of recent tsunamis, and the ults seem to show that certain simple features could be accounted for by a simple theoretical del as presented in this article. This theory would only be applicable to statistical condi- as and not to individual cases. Even for the statistical cases, the theory may probably be crude, although most of the general features from observations seem to be in rough agree- nt with the theoretical results. Many problems, however, remain unsolved: (1) physical erpretation of numerical constants k and α; (2) decay processes during the later stages; rate of decrease of amplitudes (or energy) with travel distance, and so on. With more ervations, especially with measurements in the open ocean, the whole problem might have be reconsidered from entirely different views. However, it might be of some interest to that certain outstanding features revealed on tsunami records at coastal stations can be erpreted fairly well by such statistical considerations of processes concerning the transmission energy as discussed above. Perhaps, similar ideas would also be applicable to certain other physical phenomena such as energy transmission of seismic waves. *Subject Heading:* Tsunamis.—*Author's abstract.*

11.5–206 551.465

Clarke, David B. and Bryson, Reid A., **Investigation of the circulation over Second Point r, Lake Mendota.** *Wisconsin. Univ. Lake Investigations Committee, Report No.* 16, Feb. 58. 10 p. 6 figs., 2 refs. **DWB** (M(055) W811re)—The flow of water in the middle d surface layers around and over a lake bar (summer of 1954, Second Point Bar, Lake ndota, Madison, Wisc.) was examined in terms of horizontal and vertical velocities, and ergence. These quantities were mapped and the patterns correlated with the general rrent velocity, wind conditions and obstruction by the bar. The flow above the thermocline s only slightly affected by the bar whereas the water within the thermocline was subject to ong vertical motion. *Subject Headings:* **1. Lake currents 2. Lake Mendota, Wisc.**—*uthors' abstract.*

11.5–207 551.556.8:551.465

Rivière, André and Vernhet, Solange, **Sur les courants de retour.** [Undertow currents.] *adémie des Sciences, Paris, Comptes Rendus,* 249(16):1546–1547, Oct. 19, **1959.** 3 refs. **WB, DLC**—Waters driven to the shore by winds give rise to typical undertows, because ey are not deviated through stronger hydrodynamic slopes corresponding to wave currents to rip currents. Description of the equipment used and statement of the method for ob- ving these currents are included. The movement of water under the action of wind is perficial while the undertows concern a thick layer of water. When wave currents or rip rrents appear, the undertow flow follows the stronger hydrodynamic slope corresponding to ese phenomena. *Subject Headings:* **1. Wind effects on water surfaces 2. Ocean currents Wind driven currents 4. Rip currents 5. Undertow currents.**—*A. V.*

11.5–208 551.575.7/.2:551.465:551.462

Robinson, Allan and Stommel, Henry, **Amplification of transient response of the ocean storms by the effect of bottom topography.** *Deep-Sea Research,* New York, 5(4):312–314, ay **1959.** 4 refs., 12 eqs. **DWB**—Irregularities in bottom topography of the ocean, such as bmarine mountain ranges or mountains, are shown to be of great significance in fixing the ale and amplitude of transient barotropic currents induced by cyclonic storms. A com- icated formula is derived for the case of a cellular form of bottom topography. Order of agnitude data are then substituted in the formula for the parameters of depth, dimension of orm (wavelength and amplitude) and of bottom configuration, frequency of storm, latitude, avity, and deriving amplification factor and resonance frequency, etc., to show that results e in accord with the observed transient currents in the Atlantic off Portugal, and that ve- cities may be an order of magnitude greater than those with the scale of the moving wind stem (1.6 cm/sec once every 2 weeks). *Subject Headings:* **1. Transient barotropic ocean urrents 2. Submarine topography.**—*M.R.*

11.5–209 595

Kaye, Kenneth W. (*U. S. Navy Hydrographic Office*), **Biological fouling vs. water te perature and related considerations.** *Mariners Weather Log*, Wash., D. C., 1(6):160–1 Nov. **1957.** 3 figs. **DWB**—The accumulation of attached marine plants and animals ships' hulls and underwater structures have been reduced since World War II, by some a fouling measures. This report discusses regions where fouling is prevalent, fouling in harb temperature control of fouling, their severity and expectations. Research is being contin to make anti-fouling paints universally effective. *Subject Headings:* **1. Barnacles 2. Biolog fouling.**—*N.N.*

11.5–210 551.311.182:629.12(2

Lee, Arthur (*Fisheries Lab. Lowestoft*), **Ice accumulation on trawlers in the Barents S** *Marine Observer*, London, 28(181):138–142, July **1958.** table, 4 photos, 6 eqs. **DLC**— author gives reasons why ice accumulated on the "Ernest Holt" while she was in the Bare Sea on March 9th and 10th, 1953 while steaming from Bear Island to Hope Island. Mete logical data available at that time are discussed in detail. *Subject Headings:* **1. Ice accumu tion on ships 2. Barents Sea.**—*N.N.*

11.5–211 551.589.5:551.509.318:551.311.18(210.5)

Nusser, Franz, **Zusammenhang zwischen Grosswetterlage und Eisvorkommen an deutschen Küsten.** [Relations between general weather situations and ice occurrence on German coasts.] *Deutsche Hydrographische Zeitschrift*, Hamburg, 11(5):185–194, 19 3 tables, 9 refs. German, English and French summaries p. 185. **DWB**—The relationsh between general weather types or weather situations, respectively and ice occurrence on German coasts are studied for the purpose of establishing and compiling the fundamental fa of scientifically founded ice forecasting. Therefore, the general weather types and weat situations that occurred according to records of the last 60 yrs during the ice period from Nov. to 10 April are investigated. In addition to the most frequently occurring weat situations with westerly winds, unfavorable to ice generation, there occur weather situati favoring it. The strongest ice generation is produced in the presence of weather situati characterized by easterly and northeasterly currents, in particular, when high pressure prev over Fennoscandia. There exist relationships between the frequency of different weat situations and the occurrence of different types of ice winters. A limitation of the gen weather situations to the space of time; period of ice generation—days with ice—period of melting make it possible to separate weather situations favoring ice generation from those favorable to it. As it is difficult to sort each of the factors according to its effectiveness w regard to ice generation, it seems to us that a simple and reliable means of practical ice foreca ing consists in considering the weather situations as an integral comprising the various fact *Subject Headings:* **1. Weather type-ice occurrence relationships 2. Ice forecasting 3. Gern Coast.**—*Author's abstract.*

11.5–212 551.596.1:551.

Ganson, P. P., **O formulakh dlia rascheta skorosti rasprostraneniia zvuka v morskoĭ vo** [Formulas for computing the speed of propagation of sound in sea water.] *Meteorologi Gidrologiia*, Leningrad, No. 4:30–34, April **1958.** 3 figs., table, 12 refs., 8 eqs. **DWB, DL** The author examines critically a number of theoretical and empirical formulas for calcula the velocity of sound propagation in sea water. These formulas include those of Maur Schumacher, A. B. Wood and U. Brown, V. A. del Grosso, etc. For the most pre theoretical computation of sound propagation in sea water, $C=\sqrt{\gamma/\rho\beta}$ it is necessary to de mine experimentally the coefficient of isothermal compression of sea water. This coeffic can be determined in the first approximation by solving equation for $\beta=\gamma/C^2\rho$. In orde calculate the velocity of sound on the basis of temperature and salinity it is necessary to use nomograms or correction tables of del Grosso. In the formula of del Grosso it is neces to alter the coefficients in the second and third terms so that the equation becomes $C=14$ $+4.518\ t-0.0423\ t^2+1.25\ (S-35)-0.011\ (S-35)t+0.0027.10^{-5}\ (S-35)t^4-2.10^{-7}\ (S-$ $+(1+0.577\ t-0.0072\ t^2)$. *Subject Headings:* **1. Acoustical propagation in sea water 2. Ac tical propagation speed computation.**—*I.L.D.*

11.5–213 551.464

Eriksson, Erik, **A note on the dispersion of a salt-water boundary moving through saturated sand.** *American Geophysical Union, Transactions*, 39(5):937–938, Oct. **1958.** 2 refs., DWB, DLC—Theoretical aspects on this problem are presented referring in particular to recent work by Day (1956). The theoretical approach by Day is criticized because it involves a time-dependent dispersion function in a stationary flow. It is pointed out that the dispersion in an isotropic medium should be limited and depend only on the soil material whereas in an anisotropic medium the dispersion is expected to depend also on the length of the level of the front. *Subject Headings:* **1. Salt water boundary dispersion 2. Sand permeability 3. Salt water.**—*Author's abstract.*

11.5–214 551.465(263)

von Arx, W. S.; Bumpus, D. F. and Richardson, W. S., **On the fine-structure of the Gulf Stream front.** *Deep-Sea Research*, London, 3(1):46–65, Oct. **1955.** numerous figs., 26 refs. DLC—Airplane and ship observations reported in this paper (Florida Straits) reveal a Gulf Stream structure which can be interpreted as a succession of overlapping segments, or shingles. Several scales of such shingles appear to occur, some of the order of 100–500 km long, some several tens of km and some less than 10 km. Diagrams of the sections observed are presented. The characteristic velocities in the cores of the filaments are around 1½–3 inch/sec but considerable fluctuations within a day, and of longer period, exist. *Subject Headings:* **1. Gulf Stream front 2. Florida Straits.**—*G.T.*

11.5–215 551.46.018

Danoy, Henri and Kernéis, Arnelle, **Description d'un appareil pour l'étude hydrologique de certains milieux marins benthiques.** [Description of an apparatus designed for the hydrologic study of certain benthic marine media.] *Académie des Sciences, Paris, Comptes Rendus*, 247(16):1224–1226, Oct. 20, **1958.** ref. **DWB, DLC**—Description of an apparatus taking samples of sea water from among the plants which form a meadow above the elevated rhizomes. It consists of a valve-bottle which may be dropped to the bottom where, owing to a special device, it takes a horizontal position in order to ensure a normal water circulation. This very handy apparatus may also be used to secure samples of water directly on the bottom. The special device prevents the penetration of foreign bodies. *Subject Heading:* **1. Oceanographic sampling instruments.**—*A.V.*

11.5–216 551.79:593.12:551.352/353

Emiliani, Cesare, **Temperature and age analysis of deep-sea cores.** *Science*, Wash., D. C., 125(3244):383–387, March 1, **1957.** 2 figs., 3 tables, 16 refs. **DLC**—An analysis is given of the differences between the stratigraphy of foraminiferal lutite in deep sea cores and the relationship to continental pleistocene stratigraphy. The author points out the need for more detailed research, particularly in the isotopical analysis of closely spaced samples from deep-sea cores covering the last 20,000 yrs, since the dating of the last temperature rise of the superficial craters of the oceans is at present unsatisfactory. A graph of isotopic temperatures/foraminiferal abundancies of cores is given in the article. *Subject Headings:* **1. Deep sea core sampling 2. Foraminifera 3. Pleistocene period.**—*N.N.*

11.5–217 551.352/353:551.79:593.12

Ericson, David B. and Wollin, Goesta, **Correlation of six cores from the equatorial Atlantic and the Caribbean.** *Deep-Sea Research*, London, 3(2):104–125, Feb. **1956.** 11 figs., 6 tables, 8 refs. **DLC**—Curves of late Pleistocene climate variation based on vertical distribution of planktonic Foraminifera in six cores from the Equatorial Atlantic and Caribbean have been satisfactorily correlated. Variation in percentage of material coarser than 74 microns and variation in coiling direction of *Globorotalia truncatulinoides* have also been used in correlation. Such correlation is construed as evidence that the sediment sections in these cores have accumulated slowly, and without interruption by slumping or turbidity current deposition. *Subject Headings:* **1. Deep sea core sampling 2. Foraminifera 3. Pleistocene period.**—*Authors' abstract.*

11.5–218 551.46(26

*†Postma, Hendrik, **Hydrography of the Dutch Wadden Sea: a study of the relations tween water movement, the transport of suspended materials and the production of orga matter. 1954.** 106 p. Thesis (Doctor of Science)—Groningen Univ. 55 figs., 23 tabl bibliog. p. 103–106. **DLC** (GC593.P6)—The contents of this monograph are as follo description of the area investigated, the sampling and analysis procedure, hydrography; exchange of water between Wadden Sea and the "World Sea" including distribution of salin and temperature, the influence of water measurement of different densities, etc., distribut and transport of suspended matter and the cycle of organic matter. Numerous tables, gra and diagrams are presented. *Subject Headings:* **1. Hydrography of Dutch Wadden 2. Dutch Wadden Sea.**—*I.L.D.*

2. HYDROLOGY

See also: **Rainwater infiltration** (Befani et al.), 11.5–1; **Lake level variations** (Harbeck, Coffay), 11.5–308; **Reservoirs and water resource fluctuations** (Thomas), 11.5–309; **Water supply** (Wood), 11.5–311.

11.5–219 551.48.

Hermant, M. and Wolf, M., **Quelques applications pratiques de la tuyère électromagn que pour la mesure des faibles vitesses.** [Practical applications of the electromagnetic no to the measurement of low flow velocities.] *La Houille Blanche*, Grenoble, 14(Spec. No. 883–891, Dec. **1959.** 8 figs. **DLC**—The authors describe the working principle of the strument, which measures the flow velocity of a liquid by means of the electrical field indu into it by a magnetic field. A brief description of the electromagnetic nozzle embodying principle is given. It is designed to measure very low velocities ranging from 1 to 100 mm/ Examples are given of applications to the measurement of leakage through the gates small dam, to leakage through a turbine distributor and to leakage in the headrace tunnel hydroelectric power station. *Subject Headings:* **1. Flow meters 2. Flow velocity measurem** —*Authors' abstract.*

11.5–220 53

van Eepoel, P. (*Univ. of Brussels, Belgium*), **Measuring small differences in fluid le** *La Houille Blanche*, Grenoble, 13(5):576–579, Oct. **1958.** Eqs. English summary p. **DLC**—A micromanometer which is simple, cannot get out of order, and is unaffected by liquid leaking or evaporating. Requires no special bracket, fitting, adjustment or other man intervention. It consists of a rigid assembly, which does not give rise to friction betw solid bodies and which contains devices for measuring, calibration and the determinatio temperatures for corrections. Has applications in aerodynamics and hydrodynamics. Ha potentially large amplification factor (>2 000) associated with a multiple scale measu range which is potentially very broad (several centimeters). *Subject Headings:* **1. Mi manometers 2. Applications in aerodynamics and hydrodynamics 3. Fluid level differen** —*Author's abstract.*

11.5–221 551.495:62

Littleton, R. T. (*Tex. Bd. of Water Engineers, Austin*), **Subsurface water reservoir Texas.** *Texas A. and M. College, College Station, Proceedings of the 3rd Annual Confer on Water for Texas, Sept. 1957*, (issued **1958?**) p. 18–23. 3 figs. **DWB** (M79 C748pro), (TD201.T37)—The geologic, hydrologic, and development background of five major grou water reservoirs are given in general terms. The reservoirs are: Edwards, Carrizo-Wil Ogallala, Gulf Coast and Trinity. *Subject Headings:* **1. Ground water storage 2. Reserv 3. Texas.**—*N.N.*

11.5–222 532.5:551

Rose, Walter D. (*Dept. of Mining and Metall. Eng., U. of Illinois, Urbana*), **Calculat based on the Kozeny-Carman theory.** *Journal of Geophysical Research*, Wash., D. C., 64 103–110, Jan. **1959.** 4 figs., 2 tables, 11 refs., 10 eqs. **DLC**—Fluid flow in porous media, as sands, sandstones, and carbonate rock, can be analyzed by experiment (Darcy's law)

the Kozeny-Carman theory. The latter is based on the supposition that somehow the ductivity (permeability) of porous rocks is related to pore shapes and tortuosities, to the rosity, and to the boundary surface area against which the flowing viscous fluid is dragging. test these ideas, a model of porous rock is selected which may be described as a random king of spheres of various sizes. The porosity and surface-area terms are then calculated m geometric considerations. Then the character of the model is modified by assuming that portion of the pore space is occupied by an immobile wetting phase located as pendular rings each intersphere contact. The effective porosity and surface-area terms are calculated this new condition, so that the effect of the pendular ring material on permeability can be mputed, and so that a check of the Kozeny-Carman theory can be obtained. The fore- ng procedure is an indirect method which avoids the complication of explicitly evaluating re shape and tortuosity parameters. It is shown that permeability appears to increase as ndular ring material is added to the packing, to an extent not inconsistent with expectations. *bject Headings:* **1. Fluid flow in porous media 2. Kozeny-Carman theory.**—*Author's abstract.*

11.5–223 551.579.5:551.501.4

Rockwood, David M. (*U. S. Army Engineer Div., North Pacific*), **Columbia Basin stream- w routing using an electronic computer.** (In: Washington (State). College, **Proceedings the WSC Hydraulics Conference, Oct. 1957,** Pullman, Wash. pub. **1957.** p. 113–117. ., 2 refs., 6 eqs.) **DWB**—Computational techniques and new horizons in data processing electronic computers, particularly in the field of hydrology, synthesis of streamflow from infall or snowmelt, and routing streamflow through lakes, reservoirs, and channels, are scussed here on a day-to-day basis, for a basin as large as the Columbia with its computational oblems. The essential requirements for the solution of these problems are outlined, based on e utilization of the appropriate meteorologic and hydrologic data. The problem of short nge streamflow forecasting for the Columbia has been essentially resolved to that of forecast- g meteorological events during the forecast period. *Subject Headings:* **1. Hydrologic data ocessing 2. Stream flow routing 3. Data processing with electronic computers 3. Co- mbia River Basin.**—*N.N.*

11.5–224 631.67:633.2

Van't Woudt, Bessel D., **On the estimation of irrigation needs in New Zealand.** *New aland. Dept. of Scientific and Industrial Research, Information Series*, No. 12, **1956.** Re- inted from Conference on Soil Moisture, Dominion Physical Laboratory, Sept. 1954, **Proceed- gs,** p. 109–149. 4 figs., 4 tables, 12 refs., 12 eqs. **DWB**—Experimental results on pasture owth in New Zealand show a relation between this and meteorological data. The results om the water application on a daily basis show that applications of 1.5 in. per week were sufficient, in spite of the fact that the latter quantity generally exceeded evaporation. Data dicated that moisture requirements of a pasture do not greatly vary from measured evapora- on, but they call attention to the factor of frequency of application. Evaporation from an pen water surface by a standard Meteorological Service instrument was measured at 20 ations in various, widely separated parts of New Zealand over periods varying from five to venty-five years. Variation from place to place is illustrated by data on evaporation during ne most critical month, January, when it varies from 4.6 in. to 6.4 in. for 17 stations, with ree stations at exposed sites measuring 7.5, 7.5 and 7.8 in. of water. The average of the 17 ations was 4.8 in. The data from year to year varied by 5% to 10%. A knowledge of a rrelation factor between evaporation and transpiration allows one to determine the variation irrigation needs throughout the season in New Zealand. *Subject Headings:* **1. Irrigation equirements 2. Pastures 3. New Zealand.**—*N.N.*

11.5–225 551.579:551.506.1(481)

Norway. Vassdrags- og Elektrisitetsvesenet. Hydrologiske Andelingen, **Hydrologiske ndersokelser i Norge: utdrag av det hydrologiske materiale for 50-arsperioden 1/9 1900– /9 1950.** [Hydrologic investigations in Norway: extract of the hydrologic material for a 50 ear period, Sept. 1900–Sept. 1950.] Oslo, Aschehoug, **1958.** 236 p. 54 charts, 2 maps colored, in pocket), numerous tables. Text and legends in Norwegian and English. **DWB**—

(M79 N892hy)—A large volume of data tables, graphs and folded color maps of Norwa giving a list of river and lake gages and their coordinates and period of record, characteris spring floods for stations with over 10 years record, characteristic monthly and annual runc accumulated and duration runoff, etc. for 350 stations. *Subject Headings:* **1. Hydrologic da summaries 2. Runoff data for Norway 3. Norway.**—*M.R.*

3. GLACIOLOGY

See also: **Glacier met.**, 11.5–25; **Geodetic measurement of glaciers** (Hofmann), 11.5–189.

11.5–226 551.324:551.5

Barnier, Lucien, **Sommes-nous menacés par un nouveau déluge?** [Are we threaten with another deluge?] *Geographia*, Paris, 93:13–21, June **1959.** fig., 5 photos. **DLC** Recent investigations in glaciology show a diminution in the area of mountain and pol glaciers. Short account of the IGY glaciology program is given. Author deals with glacie polar differences and conditions required for a new glaciation. Survey of the hypothes advanced to explain the great climatic changes. *Subject Headings:* **1. Glaciology 2. Glaci retreat 3. IGY glaciology program 4. Climatic changes.**—*A.V.*

11.5–227 551.324 551.521.

Emiliani, Cesare, **Glaciations and their causes.** (In: California. Univ. Scrip Institution of Oceanography, **Proceedings (of the) Conference on Recent Research in Clim tology,** March, **1957.** Issued Univ. of California. p. 36–42. **DWB** (M8 C153co)—On t basis of geological, paleontological, isotopic and other evidence, the thermal history of t earth's climate is outlined. The author also develops a possible mechanism of glaciation a retreat, assuming mountain formation and the resulting increase in albedo (increase of cloud ness due to turbulence, transformation of marine into land areas, forests into high plateau etc.), as the triggering cause of the ice age cycle. Interactions between the Northern a Southern Hemispheres are also considered as part of the glaciation mechanism propose *Subject Heading:* **1. Glaciation.**—*G.T.*

11.5–228 551.324.6(234.

*Garavel, L. and Poggi, A., **Comportement des glaciers Alpins Français depuis 1930.** [B havior of glaciers in the French Alps since 1930.] (In: I.U.G.G. Association of Scienti Hydrology, **Symposium de Chamonix, Sept. 1958,** pub. Gentbrugge, **1958.** p. 14–36. fi 25 tables.) **DWB** (551.311 I611sy)—Data on the level variations at individual profiles a frontal displacements of 25 glaciers are tabulated for various years from 1930–1956. T records show a general frontal recession and a decrease in the thickness of glacier fronts. T glaciers were out of harmony with the climate during the period of study. *Subject Headin* **1. Glacial ablation 2. Glacier thickness 3. French Alps.**—*SIPRE abstract.*

11.5–229 551.324(48

Groom, G. E. (*Dept. Geog., Univ. Coll. of Swansea*), **Niche glaciers in Bünsow Land, Ve spitsbergen.** *Journal of Glaciology*, London, 3(25):369–376, March **1959.** 5 figs., 13 re **DWB, DLC**—Small glaciers lying in funnel-shaped hollows on steep slopes have been variou described as wall-sided glaciers, cascade glaciers, cliff glaciers and niche glaciers. This ty of glacier and the landforms associated with them in Bünsow Land, central West Spitsberg are described and their possible mode of origin is discussed. The theory that they w formed by an overspill of plateau ice and that they are thereby genetically related to hangi glaciers is rejected. It is suggested that they are formed by an accumulation of snow in initially waterworn gully and that as the small glacier develops the original form of the gu is modified by nivation to a rounded, funnel-shaped hollow. Niche glaciers may thus considered as glacier types genetically related to cirque glaciers, forming an early stage corrie development. *Subject Headings:* **1. Niche glaciers 2. Glacier classification 3. Büns Land, Norway.**—*Author's abstract.*

11.5–230 551.324.82(988)

Langway, Chester C., Jr. (*Snow and Ice Basic Res. Branch, USA SIPRE*), **Bubble ssures in Greenland Glacier ice.** (In: I.U.G.G. Association of Scientific Hydrology, nposium de Chamonix, Sept. 1958, pub. Gentbrugge, 1958. p. 336–349. 6 figs., 18 refs., .) **DWB** (551.311 1611sy)—The results of tests on the average bubble pressure in 50–60 samples of ice obtained in 1957 from ice cores in the dry-snow zone 320 km E. of Thule a depth of 1345 ft are discussed, and the measuring techniques are described. After accurate nsity determinations by the hydrostatic method, each sample was cleared of entrapped air and mediately placed in the bubble-pressure apparatus. The pressure of air in the enclosed bbles was taken as the ratio of the volume of voids to the volume of air expelled on melting. bble pressure and absolute load pressure are related linearly. The bubble pressure is marily a function of density and secondarily of the structure and packing arrangement of e grains. Since the air does not diffuse out, the bubbles reflect the pressure within the ice ss, which increases with depth. The gas from depths down to 311 m was similar to today's nospheric air content, the implication being that the site has been a dry-snow zone for at st 700 yr. Data are graphed on the depth-density relation of the core samples, bubble essure vs. the reciprocal of the void ratio, and absolute load pressure vs. bubble pressure. ie bubble-pressure apparatus is described. *Subject Headings:* **1. Air content of ice 2. Bubble essures in glacier ice 3. Greenland.**—*SIPRE abstract.*

11.5–231 551.324(234.3)

Lindig, Gerhard, **Feinbewegungsmessungen an einigen Ostalpen-Gletschern.** [Detailed locity measurements on some East Alpine glaciers.] *International Union of Geodesy and ophysics. Association of Scientific Hydrology, Toronto, Sept.* 1957, [*Transactions*], Vol. 4, b. **1958.** p. 455–474. 8 figs., 10 tables, 8 refs. **DWB, DLC**—During the years 1953 to 56 precise measurements of the velocity by means of a theodolite were performed on three aciers of the Ötztaler Alps. The observations made at regular intervals of half an hour to e hour during day and night show the following results. The Gepatsch Glacier shows a ictly linear movement at the point of observation while the Hintereis and the Gurgler laciers had in addition superposed pulsation. Retrograde and short, jerky motions have en observed. *Subject Headings:* **1. Glacier movement 2. Ötztaler Alps.**—*Author's abstract.*

11.5–232 551.324.4:551.506(449.92)

Péguy, Charles-Pierre and Blanchet, Guy, **Les conditions météorologiques de l'ablation r le glacier de St. Sorlin (Eté 1957).** [The meteorological conditions of ablation on the St. rlin glacier, summer 1957.] *Germany. Deutscher Wetterdienst, Berichte,* 8(54):14–17, **1959.** figs., table, 2 refs. French, German and English summaries p. 14. **DWB, DLC**—The rface of the St. Sorlin Glacier (Savoy) has receded from 455 ha in 1905 to 357 ha in 1957. s volume has diminished for more than 110,000 m³. The balance of the year 1957 was gative. The deficit between increase and ablation amounted to 290 mm. Measurements of diation and albedo have been carried out. The important role of the temperature maxima r the ablation has been pointed out. *Subject Headings:* **1. Glacial ablation data 2. Tem- erature effects on glaciers 3. St. Sorlin Glacier, France.**—*Authors' abstract.*

11.5–233 551.324(58):551.583.2

†Zabirov, R. D., **Sovremennoe sostoianie lednikov Sredneĭ Azii.** [Present state of glaciers Central Asia.] *Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu IGG (IGY), Informatsionnyĭ Biulleten'*, No. 5:91–94, **1958.** 12 refs. **DWB**—The author views available information on the present state of the glaciers of Central Asia on the basis publications that have appeared during the period 1936–1955. The continuing regression nd extinction of glaciers in the Altai is also accompanied by stationary states and actual dvances of other glaciers (between 1928 and 1933 the Grum-Grizhmailu Glacier advanced 75 m). The Fedchenko Glacier showed regression, stationary state and also advances. . B. Shnitnikov has shown that there has been no progressive desiccation of climate in the ourse of historical time; hence the causes of the retreat of glaciers lie in the history of their evelopment. Evidence on the greater thickness of terminal parts of glaciers and on their reater extent is summarized for various glaciers in Central Asia, such as the Pamir and Tien

Shan glaciers and the gradual regression of glaciers in Central Asia as a result of present clima conditions is indicated. *Subject Headings:* **1. Glacier variations 2. Central Asia.**—*I.L.D.*

11.5–234 551.311.1(234.3)(43

Klebelsberg, R. von, **Ergebnisse der Gletschermessungen des Oesterreichischen Alpe vereins in den österreichischen Alpen 1956 und 1957.** [Results of glacier measurements of t Austrian Alpine Society in the Austrian Alps in 1956 and 1957.] *Zeitschrift für Gletscherkun und Glazialgeologie*, Innsbruck, 4(1/2):121–129, **1958.** tables. **DWB, DLC**—Tabulated da with very brief notes are given for the following mountain groups and/or regions: Höchkon Dachstein, Silvretta, Ötztaler Alps, Stubaier Alps, Zillertaler Alps, Glockner group and t Ankogel-Hochalmspitz group. *Subject Headings:* **1. Glaciological observations 2. Austri Alps.**—*W.N.*

11.5–235 551.5:551.324:91.04(98

Kosiba, Aleksander, **Badania glacjologiczne na Spitsbergenie w lecie 1957 roku.** [Glac logical investigations of the Polish IGY Spitsbergen expedition in 1957.] *Przegląd Ge fizyczny*, Warsaw, 3(2):95–122, **1958.** 10 figs., 3 tables. English summary p. 118–12 **DWB, DLC**—A report giving, in photographs, tables, graphs and text, the result of investig tions (land and sea ice) of two glaciers in the region of Hornsound Fiord during the summer 1957. Since the glaciers represent two different types in respect to climate, hydrological a orographic conditions, and one of the main aims was the study of relationship between clima conditions and changes in glaciation, extensive observations of meteorological elements su as air temperature and pressure, air humidity, precipitation, evaporation, solar radiatio wind force and direction, cloudiness, etc., were carried out and are recorded in tables. Thic ness of snow and ice, type, mechanical strength, electrical resistance, temperature in snow a ice profiles, density of fiord ice and water temperature are among the parameters observed a analyzed. Equipment and methods of observations are described. *Subject Headin* **1. Glaciological observations 2. Glaciological expeditions 3. Glacier-meteorological o servations 4. Spitsbergen.**—*A.M.P.*

11.5–236 550.34:551.324(9

*†Robin, G. de Q., **Seismic shooting and related investigations.** *Norwegian-Briti Swedish Antarctic Expedition*, 1949–1952, *Scientific Results*, Vol. 5 (Glaciology III), pub. Os **1958.** 134 p. 59 figs., 39 tables, 100 refs., eqs. **DWB**—An elaborate monograph giving details and results of seismic sounding studies made in Queen Maud Land by the N-B Antarctic Expedition of 1949–52. A systematic description is given of all equipment a apparatus, their performance, transport and installation for field work described, vario methods compared, propagation and reflection of P-waves treated, surface profiles discusse dependence of velocity of P-waves on physical properties of ice and firn analyzed, and resu tabulated shown graphically and in tables. A good bibliography is appended along wi detailed maps, profiles and records. In all, 950 shots were fired at 178 stations and so success was attained at 134 points. *Subject Headings:* **1. Seismic shooting 2. Glaciologi investigations 3. Norwegian-British-Swedish Antarctic Expedition, 1949–1952 4. Que Maud Land, Antarctica.**—*M.R.*

11.5–237 550.34:551.578.463:551.3

Förtsch, O. and Vidal, H. (*both*, *Munich*), **Seismo-glaziologische Studien an eine Gletscherfleck.** [Seismo-glaciological studies in a nivation type glacier.] *Zeitschrift f Gletscherkunde und Glazialgeologie*, Innsbruck, 4(1/2):35–45, **1958.** 3 figs., 7 refs. Germ and English summaries p. 43–44. **DWB, DLC**—The seismic measurements of the Brandt Glacier (2,600 m.a.s.) August 1955, were conducted by means of a so-called geophone wit pick-ups permitting measurement of the time required for the elastic impulse to travel fr the point of discharge to the pick-up. The discharge of explosives up to 1250 g at 1 m and 2 depths in the firn resulted in 25 seismic profiles from which the following data were derive The ice thickness differed 20–25 m, ±3–4 m allowance for error in calculation. The ice volu of the entire 0.027 km³ as calculated from contour maps correspond to 22 million m³ of wat Concluded that the glacier is composed of firn, snow and ice, hence is a nivation type glaci

ject Headings: **1. Glacier-seismological studies 2. Glacier ice 3. Brandtner Glacier, tria.**—*W.N.*

11.5–238 551.324(234.8)

Dolgushin, L. D. and Kemmerikh, A. O., **Novye ledniki na Urale.** [New glaciers in the ls.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr.*, No. 6:67–75, **1957.** 6 figs., table, fs. **DWB**—The authors briefly summarize some of the investigations on the Urals during past fifty years and with the aid of maps and photographs describe in detail the character- cs of some of the large glaciers of the Polar Urals. A list of all the glaciers investigated in 3 and 1957 is presented. The area occupied by 20 Polar Ural glaciers is 8 km², almost ce the glacial area of the cis-Polar Urals; seven of the glaciers have an area greater than t of the Gofman Glacier hitherto considered the biggest in the Urals. The glaciers de- bed include the following: Institute of Geography Glacier on the eastern slope of the Khard- urdy-Keu, south of the eastern tip of Lake Bolshoi Khadatinsk (the largest glacier in the als with an area of 1.4 km²); the IGY glacier; the V. A. Obruchev Glacier; the Karskii acier and the Number 17 Glacier. The material collected leads to the following conclusions: glacial region of the Urals possesses all types of snow-glacier formations from firn snow to ual mountain glaciers; most of the glaciers are located in deep depressions of the eastern rth of the horizon but glaciers are also present on open slopes of this exposure; the surface of Polar Ural glaciers is marked by streaks indicating the stratiform structure of the ice; glaciers of the Polar Urals are morphologically active (they form large lateral and terminal raines); at present all the glaciers investigated are in a state of retreat; the contemporary ciers are a remnant phase of young valley glaciation which developed in the Urals after the st-glacial temperature maximum. *Subject Headings:* **1. Glaciers 2. Ural Mountains.** *I.L.D.*

11.5–239 551.322:539.3(988)

Butkovich, T. R. and Landauer, J. K. (*both, SIPRE, Wilmette, Ill.*), **The flow law for ice.** n: I.U.G.G. Association of Scientific Hydrology, **Symposium de Chamonix, Sept. 1958,** pub. ntbrugge, **1958.** p. 318–327. 4 figs., 2 tables, 13 refs., 3 eqs.) **DWB** (551.311 I611sy)— ne results of laboratory creep tests in a shear apparatus at −5°C on 2×2× 3/8 in. samples of mmercial ice, artificial single crystals, and 6 types of ice from the Greenland Ice Cap, at ear stresses of about 0.5–3 kg/sq cm are reported. Some uniaxial tests were made at stresses m 6–28 kg/sq cm to supplement the shear tests. Creep data could usually be represented pproximately by one or more linear sections on a log deformation vs. log-time plot. The ear sections of the double logarithmic curve imply a creep curve of the form $\epsilon = ct^m$, where ϵ the strain. For all samples tested, except single crystals sheared in easy glide, m averaged 5 for shear deformations up to about 1%, and approached unity for more deformation. For gle ice crystals oriented for easy glide, m averaged 1.7, implying a strain softening. Single ystals oriented for hard glide behaved similarly to polycrystals, indicating a rate-controlling rocess such as dislocation climb. For all but single easy-glide crystals, the min. creep rate as tangent to the deformation curve at the end of the experiment. Creep rates for single sy-glide crystals were several hundred times larger than for other crystals, the flow laws eing similar. *Subject Headings:* **1. Creep test data 2. Flow law for ice 3. Greenland Ice ap.**—*SIPRE abstract.*

11.5–240 551.324.3(99)

Cailleux, André, **Altitude du Continent Antarctique et loi des altitudes de Matschinski.** Altitude of the Antarctic mainland and Matschinski's law of altitudes.] *Académie Royale de elgique, Brussels. Classe des Sciences, Bulletin*, 5th Ser., 65(3):251–255, **1959.** 2 figs., refs. **DLC**—According to MATSCHINSKI's law of altitudes, the ice depth of the Antarctic e cap should be greater than was previously believed. Author arrived at the same conclusions n the basis of glaciological data obtained during the IGY. In the present note, author shows iat these two opinions coincide with each other and with the most recent measurements on ltitude and depth of Antarctic ice. After the geophysical measurements, the average depth f ice is probably between 1800 and 2500 m for the whole of the mainland. According to MATSCHINSKI's geographical and geophysical law, the average ice depth should be in the range

of 2150–2250 m. *Subject Headings:* **1. Ice depth 2. Matschinski's law of altitudes 3. Ar arctica.**—*A. V.*

11.5–241 546.212:548.5

Higuchi, Keiji (*Faculty of Sci., Hokkaido Univ., Sapporo*), **Layer structure of ice crys revealed by etching figures.** (In: I.U.G.G. Association of Scientific Hydrology, **Symposium Chamonix, Sept. 1958,** pub. Gentbrugge, **1958.** p. 249–253. 3 figs., 2 tables, 17 refs. **DW** (551.311 I611sy)—The results of studies on the structure of ice crystals revealed by therm and chemical etching are described. A layered crystal structure appeared in the later stag of thermal etching, the layers being normal to the c-axis. The pattern was similar to th observed on thermal etching of other crystals, sometimes having concentric rings. The avera step height, as measured by the shadowing method using an electron microscope, was 5.3 varying from 3.0–12.5μ. Step formation often began from a point where the base of the p was in contact with the ice surface or an adjoining pit, while concentric step patterns we observed when the pits were out of contact with ice or other pits. During chemical etchi on the basal surface of the thermal etch pits, small pits were observed, which coalesced to fo a large hexagonal pit on which layers grew from the periphery toward the center. *Subj Heading:* **1. Ice crystal structure.**—*SIPRE abstract.*

11.5–242 551.32(

†Jellinek, Hans H. G., **Adhesive properties of ice.** *U. S. Snow Ice and Permafrost Resea Establishment, Research Report,* 38, Sept. **1957.** 20 p. 8 figs. (incl. photo), 8 tables, 24 ref 13 eqs. **DWB**—Shear tests of the system snow-ice/stainless steel gave pure adhesive brea down to a temperature of about −13C, where a sharp transition to cohesive breaks was o served. Adhesive strength of the system was a linear function of temperature and independe of cross-sectional area and height of samples in the ranges tested. Shear tests of the syst ice/polystyrene gave pure adhesive breaks, with adhesive strength decreasing linearly w temperature to −15C and independent of cross-sectional area. Tensile tests of the syst ice/polystyrene revealed a linear relation between adhesive strength and temperature in t range −2C to −25.5C regardless of cross-sectional area and rate of stress application. T test results are interpreted on the basis of an assumed liquidlike layer at the interface. *Subj Headings:* **1. Ice adhesive properties 2. Ice strength.**—*SIPRE abstract.*

11.5–243 551.578.4:536.4:551.324.4

Steinemann, Samuel, **Thermodynamics and mechanics of ice at the melting point.** (I.U.G.G. Association of Scientific Hydrology, **Symposium de Chamonix, Sept. 1958,** p Gentbrugge, **1958.** p. 254–265. 4 figs., 25 refs., eqs.) **DWB** (551.311 I611sy)—The behav of monomineralic ice under stress is analyzed mathematically with respect to chemical eq librium and phase stability. Thermal conditions in a temperate glacier, the equilibrium stressed solids, phase stability in a heterogeneous one-component system, and strains and pha within the ice are examined individually. The study indicates that local melting caused strain is greatly confined and has no direct influence on strength. Diffusion-like deformati or recovery processes behave normally at the melting point, so that the mechanical proper of temperate ice may be likened to those of cold ice. *Subject Headings:* **1. Ice mechan 2. Thermodynamic properties of ice 3. Ice melting.**—*SIPRE abstract.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Soviet IGY Antarctic stations,** 11.5–14; **IGY Antarctic stations** (Benes), 11.5–15; **IGY networks,** 11.5–19; **Radar wind instruments** (Ervet, Robuchon), 11.5–258; **Radar winds** (Marc et al.), 11.5–259; **Rain gage comparisons** (Hajósy), 11.5–260; **Diffusion studies** (Barad), 11.5–271; **Nuclei sampling methods** (Georgii), 11.5–304.

11.5–244 551.501:551.510.7:551.59

El-Moslimany, A. and Spencer, N. W., **Some studies on a radioactive-ionization-g pressure-measuring system.** Michigan. Univ. Engineering Research Institute, Cont

19(604)-1511, Final Report, Dec. **1957.** 29 p. 15 figs., eq.—Radioactive ionization gages known to exhibit a significant hysteresis effect at gas densities where recombination plays important role in determining the ionization current. Several possible causes are discussed nd have been investigated; results have led to the conclusion that hysteresis is caused by anges in the attachment and recombination coefficients due to gas temperature variations. *bject Heading:* **1. Radioactive ionization gages.**—*Authors' abstract.*

11.5–245 551.501.1:551.577(02)

Yugoslavia. Hidrometeorološka Služba, **Navodilo za opazovanje in merjenje padavin.** nstructions for observation and measurement of precipitation.] Belgrade, Savezna Uprava drometeorološke Službe, **1953.** 27 p. 10 figs. **DLC** (ZC925.Y8)—A standard instruction anual for observers using various types of rain gages used in Yugoslavia plus specifications r recording cloud and hydrometeor, electrometeor and other phenomena occurring simulneously with precipitation. Instruments, operations and symbols used in recording are ustrated. *Subject Headings:* **1. Observers manuals 2. Precipitation measurement instructions 3. Yugoslavia.**—*M.R.*

11.5–246 551.501.45:551.58:63(437)

Matějka, Vladim'r, **Walterův způsob grafického znázornění klimatických poměrů.** [Walr's method of graphical presentation of climatic conditions.] *Meteorologické Zpravy*, Prague, (3):68–71, **1957.** 7 figs., 2 tables, 10 refs. Russian and German summaries p. 68. **DWB**—he graphical method of presenting climatic conditions suggested by HEINRICH WALTER for se in ecology and agriculture is reviewed. The method is being used at several stations at fferent elevations and different degrees of drought hazard. Potential evaporation according WALTER's definition is compared with measured or computed values of evaporation for urbanovo, Čáslav-Filipov, Ondřejov and Třeboň. A convenient way is shown for arranging ne climagrams in strips. *Subject Headings:* **1. Climagrams 2. Czechoslovakia.**—*Transl. of uthor's abstract.*

11.5–247 551.577.2:551.501.45

*Sneyers, R., **Remarques à propos d'une généralisation de l'indice de similitude de M. ouët.** [Comments concerning a generalization of Bouet's similarity index.] *Archiv für Meteorologie Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(1):126–135, **1959.** 7 tables, refs., 17 eqs. French, German and English summaries p. 126. **DWB, DLC**—The new dex of similarity proposed in 1955 by the present author is identical with one of the three efficients of association formerly studied by G. U. YULE. A better estimation of the sample ror is made and a generalization of this coefficient considered. A fourth statistic coefficient also defined and new examples treated. *Subject Headings:* **1. Similarity concepts 2. Bouet's milarity index.**—*Author's abstract.*

11.5–248 551.501.7

†Defrise, P.; Godson, W. L. and Pone, R. (*eds.*), **Les diagrammes aérologiques: rapport d'un groupe de travail de la Commission d'Aérologie.** [Aerological diagrams: report of a orking group of the Commission on Aerology.] *World Meteorological Organization, WMO Publication*) *OMM*, No. 66. TP. 25, **1957.** 57 p. 6 figs., forms (incl. 6 fold. in pocket), efs. p. 2–3, bibliog. (112 titles) p. 50–54. **DLC, DWB** (M(06) W927p)—An over-all discuson of the aerological diagrams used in over 53 countries of the world is given. The techniques dopted for aerological soundings, and the characteristics of the upper atmosphere as well as ne need for further work in the graphical presentation of the dynamic and thermodynamic ariables of the atmosphere are discussed. *Subject Heading:* **1. Aerological diagrams.**—*N.N.*

11.5–249 551.501.9

Gregor, A. (*Prague, Czechoslovakia*), **Klassifikatsiia mestopolozheniia meteorologicheskikh tantsii.** [Classification of the location of meteorological stations.] *Meteorologiia i Gidrogiia*, Leningrad, No. 4:23–24, April **1958. DWB, DLC**—At the suggestion of the author, ne International Climatological Commission, which met in Toronto in 1947, accepted the

following proposals for describing more specifically the location of weather stations: positi of the station in relation to the sun, characteristics of the surface relief of a locality influenc the vertical temperature gradient (local inversion), position in relation to wind and charact istics of the locality and artificial installations in its vicinity (valley, forest, city, etc.). T location is graded on a five point scale ranging from best to worst position. The designati of the position is made by symbols consisting of the initial letters of English words. Examp of the classification and coding are presented. *Subject Heading:* **1. Meteorological stati location classification.**—*I.L.D.*

OBSERVATIONAL DATA

See also: **Sec. A4,** p. 657; **Upper air obs.** (Murgatroyd), 11.5–42; **Hydrologic data summaries, Norway,** 11.5–225; **Glacial ablation data** (Péguy), 11.5–232; **IGY radiation program** (Mörikofer), 11.5–290.

11.5–250 551.506.1:627.92(261

*Netherlands. Meteorologisch Instituut, **Meteorologische en Oceanografische Waarne ingen Verricht aan Boord van Nederlandse Lichtschepen in de Noordzee.** [Meteorologi and oceanographical observations taken from the Netherlands lightships in the North Sea Vol. 3, 1951. Issued **1959.** Vol. 9, 1957. Issued **1959.** Vol. 3, 190 p. Vol. 9, 293 Both almost entirely tables. **DWB**—Three-hourly meteorological and oceanographic c servations and hourly observations of ocean currents are tabulated and summarized for lightships in the North Sea (3 in the 1951 volume): the Noord Hinder, Goeree, the Texel a the Terschellingerbank. The elements tabulated are pressure, temperature (dry and wet bul wind direction and force, cloud amount, sea surface temperature, duration of fog, and precipit tion, visibility, weather's direction, period and height of waves, time of high tide and ebb a flood displacement; vector and scalar average winds and constancy; frequency of air-sea surfa temperature; overall wind frequencies and by direction and frequencies of wave heigh (For abstracts on other vols. *see* 8.8–24, 9.7–22 and 10.6–129, *Met. Abs.*) *Subject Headin* **1. Lightship observational data 2. Annual marine meteorological data summaries 3. Neth lands lightships 4. North Sea.**—*M.R.*

11.5–251 551.506.1(49

*Netherlands. Meteorologisch Instituut, **Jaarboek (Annual), Pt. A, Meteorologie.** 19 pub. **1958**; 1956, pub. **1958**; 1957, pub. **1958** and 1958, pub. **1959.** 79 p. each. Almost e tirely tables. Text in English and Dutch. **DWB, DLC**—Detailed punched card tabulatio and summaries of data from 6 (7 in 1957 and 8 in 1958) first order and 41 second order statio in Holland obtained at 8, 14 and 19 h. Pressure, temperature, vapor pressure, relative humi ity, wind direction and speed, cloudiness, precipitation and weather phenomena, maximum a minimum temperature and precipitation for the day, hourly wind, temperature and pressu and sunshine duration are included. Monthly and annual summaries of many elements a also included for the 5 main first order and 1 ordinary station and for fewer elements for t 5 main stations and 36 ordinary second order stations. (For abstract on 1953, 19 annuals, *see* 10.6–131, June 1959, *Met. Abs.*) *Subject Headings:* **1. Annual meteorological da summaries 2. Netherlands.**—*M.R.*

11.5–252 551.506.1:551.582(49

ten Kate, H., **De bijzondere zomer van 1959.** [The exceptional summer of 195 *Hemel en Dampkring*, The Hague, 57(11):263–265, Nov. **1959. DWB, DLC**—Data relati to temperature, sunshine duration and rainfall are given for the summer of 1959 in the Neth lands and compared with data of other exceptional summers from this century. The sumn of 1959 (June, July, August) had 37 warm days (62 in 1947); its mean temperature was t highest of this century after 1947 and 1911; its highest temperature reached 36,6°C at Ven the temperature was above normal from March to October. The number of hours of sunshi reached 1520 at Valkenburg from May to September (6 months) and this is the highest va of this century. The mean rainfall from May 1 to October 10, was 145 mm, which is the low value recorded since the beginning of observations in 1849. *Subject Headings:* **1. Clima summaries 2. Weather anomalies 3. Netherlands.**—*A.V.*

11.5–253 551.506.22:551.582.2(234.8)

†Kliukin, N., **O raspredelenii meteorologicheskikh elementov na khrebte Suntar-Khaiata.** [Distribution of the meteorological elements on the Suntar-Khayata range.] *Meteorologiia i gidrologiia*, Leningrad, No. 1:26–30, Jan. **1959.** 3 figs., 2 tables, 13 refs. **DWB, DLC**—The Suntar-Khayata range, a southeastern extension of the principal chain of the Verkhoyansk range, is one of the largest mountain massifs of northeastern U.S.S.R. Meteorological data for 1957 for the IGY station Suntar-Khayata and for two meteorological stations in the foothills of Suntar-Khayata, namely, Nizhniaia Baza and Agaiakan, are presented. The annual temperature regime, the prevailing inversions, and the precipitation regime are analyzed and graphs showing the annual variation of precipitation of the three stations, and the pluviometric gradients on the southeast (ice) and southwest slope of the Suntar Khayata range, are presented. *Subject Headings:* **1. IGY stations 2. Meteorological data 3. Suntar-Khayata Range, U.S.S.R.**—*I.L.D.*

11.5–254 551.506.8(47)

†Ponomarev, B. P., **Fenologicheskie nabliudeniia.** [Phenological observations.] (In: U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Voprosy agrometeorologii,** ed. by F. F. Davitaia and M. S. Kulik. Moscow, **1958.** p. 18–21. 29 refs.)—In the U.S.S.R. phenological observations are carried out by meteorological stations of the Hydrometeorological Service, by the assessment sections of the State Commission for assessing agricultural crops, by amateurs and volunteers of the Geographical Society of the U.S.S.R. The weather stations observe the onset of dates of development of crops, of pasture grass and trees. The assessment stations observe the development of crops in the districts of their activity. The volunteers observe primarily wild plants and animals. In the assessment stations phenological observations began in 1923; the number of observing points is near 1500. At the meteorological stations phenological observations are carried out in a uniform manner. The data are transmitted to the meteorological services of the republics, to local stations and to the Central Forecasting Institute. The phenological observations are controlled by the agricultural meteorologists in the weather stations. At the stations the observations are made parallel to the meteorological and agrometeorological observations. The value of the phenological observations in agriculture is discussed briefly. *Subject Headings:* **1. Phenological observations 2. U.S.S.R.**—*I.L.D.*

INSTRUMENT CARRIERS

See also: **IGY satellite program** (Finlay), 11.5–16; **Jet aircraft instrumentation** (Murgatroyd), 11.5–42; **Satellite obs. of radiation belt** (Van Allen), 11.5–151; *also* **Sec. D8, p. 694.**

11.5–255 551.507.321.2

Kurdiani, Joseph G. (*Tbilisi*), **Neue Methode zur Ermittlung der Höhen von Pilotballonen.** [A new method for determining the height of pilot balloons.] *Beiträge zur Geophysik*, Leipzig, 68(1):37–62, **1959.** 12 figs., 5 tables, 3 refs., 63 eqs. German and English summaries p. 37–38. **DWB, DLC**—Exactness of trigonometrical definition of heights $H\delta$ and $H\gamma$ of pilot balloons with the help of base observation depends on the position of their projection and its distance from the base line. Therefore the horizontal projection is sometimes to be substituted by the vertical. Due to the variability of the vertical speed of the pilot balloon the heights may often be wrong if observed from one point. To improve the ways of height determination a method of sector speeds of pilot balloons is offered for both base and one-point observations. The use of this method for two successive instants allows to treat a pair of heights as roots of a certain quadratic equation. Its coefficients p and q are expressed as functions of the angles of the theodolite. To control the exactness of the method in question, the method of modelling of pilot-balloon observations is used. Evidence will be produced that the errors in defining the height when using the formulas p and q are no more than about 1% over the whole area of the horizon. Besides, one-point observations become equal to base observations thanks to the instant radius of the curve R which serves as a basis in these observations. *Subject Heading:* **1. Pilot balloon height determination.**—*Author's abstract.*

INSTRUMENTS

See also: **Remote recording soil thermometers** (Golubev), 11.5–12; **Scintillation counters,** 11.5–24; **Solar radio interferometers** (Malinge et al.), 11.5–80; **Instrumented space vehicles** (Spilhaus), 11.5–170; **Satellite instrumentation** (Boyd), 11.5–179; **Oceanog. sampling instruments** (Danoy, Kernéis), 11.5–215; **Flow meters** (Hermant, Wolf), 11.5–219; **Vertical transfer measurement** (Deacon), 11.5–273; **Radar hurricane tracking** (Senn, Hiser), 11.5–288; **Soil temp. instruments** (Salaruddin), 11.5–300.

11.5–256 551.508:551.510.55

Grundmann, Walter, **Meteorologische Messgeräte am Erdboden.** [Meteorologic instruments for surface measurements.] (In: Linke, Franz, **Linkes Meteorologisches Tasche buch.** New ed. Leipzig, **1957.** 3:272–347. 41 figs., eqs.) **DLC** (QC864.L53)—I struments and equipment for measuring surface temperature, cooling power, pressure, wat vapor, evaporation, precipitation, wind, dust and nuclei in the atmosphere are thoroughly an systematically described and illustrated; their calibration and corrections discussed, and uni and constants presented. Parts of recording and nonrecording instruments or elements a illustrated in detail for every type of equipment in common use. *Subject Headings:* **1. Meteor logical instruments 2. Cooling power instruments.**—*M.R.*

11.5–257 551.508.43:551.547

Rouaud, A., **Les notions d'altitude et le calage des altimètres.** [Principles of altitu and the calibration of altimeters.] *La Météorologie*, Paris, Ser. 4, No. 54:147–162, April/Ju **1959.** fig., table, eqs. French, English and Spanish summaries p. 147. **DWB**—In Pt. the author defines the "real," "standard" and "barometric" altitudes and deduces correlati equations. He concludes by comparing the real altitude with altimeter reading for differe meteorological conditions and calibrations. In Pt. 2, the author shows that the relati between pressure and altitude, for a typical atmosphere, allows for the graduation and calibr tion of altimeters. He describes the practical applications of the pressure-altitude correlati and different calibrations of altimeters permitting to resolve a certain number of aircra landing problems. *Subject Headings:* **1. Altimeter corrections 2. Pressure-altitude relatio ships.**—*Author's abstract.*

11.5–258 551.508.57 551.501.75:551.5

Ervet, P. and Robuchon, A., **Mesure fine du vent en altitude à l'aide de deux radars poursuite automatique.** [High precision measurement of upper winds by means of two aut matic tracking radars.] *La Météorologie*, Paris, Ser. 4, No. 54:121–128, April/June **195** 3 figs., 2 tables, 7 refs. French, English and Spanish summaries p. 121. **DWB**—Two aut matic tracking radars, situated 20 m apart, make simultaneous measurements of upper win by: 1) The same balloon-reflector apparatus; 2) Two identical apparatus released with interval of five minutes. A third method controlled the precision of the measurement of wi by means of two radars situated 30 km apart and following the same sounding balloon. T close conformity of the two curves representing the variation of the elements of measur wind vector as a function of altitude, shows the high precision of the radars employed. using the "double" sounding technique, an equivalent precision can also be obtained with on one radar. The error is generally less than 2 m/sec for wind speed and less than 10 degrees f direction. Moreover, there is no systematical absolute error increasing proportionally to t distance of the balloon. *Subject Headings:* **1. Radar wind instruments 2. Upper air wi vectors 3. Upper air wind measurement errors.**—*A.V. and authors' abstract.* Ⓢ

11.5–259 551.508.57 551.501.75:551.5

Marc, V.; Treussart, H. and Darmagnac, A., **Détermination des erreurs accidentell affectant les mesures effectuées au moyen d'un radar WF_1 modifié "Omera."** [Determinati of the accidental errors affecting measurements made by means of a modified WF_1 "Omer radar.] *La Météorologie*, Paris, Ser. 4, No. 54:129–145, April/June **1959.** 17 figs. Fren English and Spanish summaries p. 129. **DWB**—The error affecting the upper air wind vect

ermined by means of a radar depends essentially on accidental measurements appearing in basic data supplied by the radar. In order to determine the upper limits of the accidental ors affecting the measurements, authors take as basis the comparison of data supplied by two ntical radars placed side by side so that parallax between the two sets was negligible. ort description of the compared series, statement of the results and analysis of the primary ta. Comparisons between the results obtained in wind vector measurement, and the ults which could be obtained by means of equipment which does not give the oblique dis- nce. Finally, it is explained how to compute the upper limit of the error in wind vector on basis of errors in the measurement of the basic elements. The speeds given by the two uipments seldom differ by more than 2 m/sec and one can take this value as the upper limit accidental error. This limit can be determined to 1 m/sec for strong winds blowing in a ection close to the axis of the radar beam (radial wind). As concerns direction for winds onger than 5 m/sec, the difference between the two radars seldom exceeds 5° and one can nsider this value as the upper limit of the error affecting the data of each radar. *Subject adings:* **1. Radar winds 2. Upper air wind vectors 3. Upper air wind measurement errors.** *A.V.*

11.5–260 551.501.777:551.508.77

Hajósy, Ferenc, **Párhuzamos csapadékmérések a Meteorológiai Intézet műszerkertjében.** [Comparative precipitation measurements at the instrument site of the Meteorological Institute.] *Időjárás*, Budapest, 62(4):212–219, July/Aug. **1958.** 2 figs., 2 tables. Hungarian and German summaries p. 212. **DLC**—Simultaneous measurements with 15 rain gages were made in the garden of the Meteorological Institute at Budapest in 1955 and 1956. Variations in the readings were found to be insignificant provided the instrument was located far enough from obstacles. *Subject Headings:* **1. Rain gage comparisons 2. Budapest, Hungary.**—*From author's abstract.*

11.5–261 551.508.824

Cardot, Claude, **L'observatoire météorologique automatique.** [The automatic weather station.] *Automatisme*, 3(5):173–177, May **1958.** 7 figs. (photos). Abstracted from photostat. **DWB** (M C268ab)—Problems encountered in the French automatic weather station program in the course of developing aerial security are discussed. Regular transmission and periodic observations were carried out at three automatic stations. Problems in French observatories are noted to have occurred in other countries (United States and the Soviet Union, for example) where similar stations are in operation. *Subject Heading:* **1. Automatic weather stations.**—*N.N.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Monthly air temp. anomalies, U.S.S.R.** (Kashin, Pagava), 11.5–8; **Northern Hemisphere pressure charts** (Lahey et al.), 11.5–13; **Ice forecasting** (Nusser), 11.5–211; **Numerical investigation of general circulation** (Bryan), 11.5–274; **Long range hurricane forecasting** (Ballenzweig), 11.5–284; **Synoptic analysis of tropical cyclones** (Newman, Bath), 11.5–285.

11.5–262 551.574.1:551.509.617:551.578.7

Facy, L., **L'efficienza glaciogena dei nuclei di ioduro d'argento.** [Icing effectiveness of silver iodide nuclei.] *Simposio Internazionale sulla Fisica delle Nubi e Relative Applicazioni all'Agricoltura, Asti, Italy, April 1958, Atti*, pub. Dec. **1958.** p. 37–45. Italian and French summaries p. 44–45.—The author describes a general activating mechanism of natural or artificial freezing nuclei present in the atmosphere when condensation phenomena occur. The various possible causes of deactivation of silver iodide are reviewed. The author concludes that at present, rockets are still ineffective against hail, and so is in some cases, silver iodide dissipated from ground generators. Careful study on a microphysic scale is needed to find a

way leading to positive results. *Subject Headings:* **1. Condensation nuclei 2. Cloud seedin substances 3. Hail prevention.**—*Transl. of author's abstract.*

11.5–263 551.574.1:551.509.617:551.578

Katz, U., **Recenti ricerche di laboratorio effettuate in Svizzera per la prevenzione del grandine.** [Recent laboratory research in Switzerland on hail prevention.] *Simpos Internazionale sulla Fisica delle Nubi e Relative Applicazioni all'Agricoltura, Asti, Italy, Apr 1958, Atti,* pub. Dec. **1958.** p. 57–58. German and Italian summaries p. 58.—A summary given of the research carried out at the Federal Military Academy, where the properties different nucleating substances, especially freezing nuclei, are systematically examined. TH characteristics of condensation nuclei are being studied at the Locarno-Monti observator whereas an installation for artificial hail production will be put into action at the Weissfluhjoc Institut (Davos). *Subject Headings:* **1. Condensation nuclei 2. Cloud seeding substance 3. Hail prevention 4. Switzerland.**—*Transl. of author's abstract.*

11.5–264 551.509.617:551.578.7(433) 551.509.617(43

Müller, Hans G., **Les travaux préparatoires pour les expériences antigrêle en Bavière** [Preliminary work on hail control experiments in Bavaria.] *Simposio Internazionale sul Fisica delle Nubi e Relative Applicazioni all'Agricoltura, Asti, Italy, April 1958, Atti,* pu Dec. **1958.** p. 95–110. 11 figs., table, 5 refs. French, Italian and English summaries p. 11 A report is presented concerning the prevention of hail formation in Bavaria by cloud seedi with AgI by means of rockets or ground generators. A series of experiments will be carrie out. Geographically equivalent regions with and without seeding action will be compare A dense network of observers, independent and not influenced by the active organization defense will give objective reports. The meteorological properties of hailstorms in the are of Rosenheim and the synoptic situations causing hail in this region are studied. The organiz tion of hail prevention is tied up with the results of this study. *Subject Headings:* **1. Ha prevention 2. Cloud seeding with silver iodide 3. Rockets 4. AgI ground generato 5. Rosenheim, Bavaria, Germany.**—*A. V. and author's abstract.*

11.5–265 551.509.617:551.578.7(4

Roncali, Giorgio, **La lotta antigrandine in Italia.** [Hail control in Italy.] *Simpos Internazionale sulla Fisica delle Nubi e Relative Applicazioni all'Agricoltura, Asti, Italy, Apr 1958, Atti,* pub. Dec. **1958.** p. 91–94. table. Italian, French, English and German sum maries p. 94.—The main methods used in hail control are reviewed briefly. The numeric data relating to the use of rockets in the hail control in Italy, which has undergone wide d velopment, are set out in a table. Analytical studies undertaken by the Central Office Meteorology and Agrarian Ecology in order to evaluate the results of the campaign are referr to. *Subject Headings:* **1. Hail prevention 2. Hail rockets 3. Italy.**—*Author's abstract.*

11.5–266 551.509.617:551.578.7(43

Steinhauser, F. and Friedrich, W., **Die Versuche zur Hagelabwehr in Österreich u allgemeine Bemerkungen zum Problem der Hagelbekämpfung.** [Experiments on hail pr vention in Austria and general remarks on the problem of hail control.] *Simposio Intern zionale sulla Fisica delle Nubi e Relative Applicazioni all' Agricoltura, Asti, Italy, April 195 Atti,* pub. Dec. **1958.** p. 124–135. table, 5 refs. German, Italian and English summari p. 134–135.—From observations and statistical considerations it is shown that, for the evalu tion of the effectiveness of hail prevention by the firing of rockets, it is necessary to consid the duration of the hailstorms and the relative number of thunderstorms with hail in t total number of thunderstorms. In Austria, the experiments with hail prevention are bei done by means of rockets carrying AgI, and by AgI generators on the ground. The install tions and their operation are described. Some examples of observations of wet snowf following the firing of rockets, and on the dissipation of clouds by AgI rockets are give *Subject Headings:* **1. Hail prevention 2. AgI rockets 3. AgI ground generators 4. Clo seeding evaluation 5. Austria.**—*Authors' abstract.*

11.5–267 551.509.617:551.578.7(494)

Thams, J. C., **Gli esperimenti scientifici su vasta scala di diffesa antigrandine nella ...zzera.** [Large-scale scientific experiments on hail prevention in Switzerland.] *Simposio ...ternazionale sulla Fisica delle Nubi e Relative Applicazioni all' Agricoltura, Asti, Italy, April ...58, Atti*, pub. Dec. **1958.** p. 46–56. 4 figs., 3 refs. Italian, French, English and German ...mmaries p. 55–56.—This is a report on the large-scale scientific experiments carried out in ...thern Switzerland since 1948 to combat hail. Whereas the large-scale experiment I was ...ant to serve the study of the old-fashioned traditional method of defense by means of ...kets, the large-scale experiments II and III (still under way), were aimed at seeding clouds ... means of ground generators with silver iodide. The large-scale experiment III applies ... the first time the statistical method of randomization. It is also concerned with rain ...mulation. No sure indications, either in the positive or in the negative sense, are yet ...ailable to the effect that hail formation can be prevented by cloud seeding with silver iodide. ...owever, it appears that there probably is an effect upon the formation of rain. *Subject ...adings:* **1. Hail prevention 2. Cloud seeding with AgI 3. Cloud seeding evaluation ... Switzerland.**—*Author's abstract.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

DENSITY AND COMPOSITION OF THE ATMOSPHERE

See: **Upper air density** (Groves), 11.5–164, 11.5–165.

UPPER ATMOSPHERE—IONOSPHERE

See also: **Upper atmos.** (Newell), 11.5–11; **Sr ^{90} stratospheric storage** (Machta, List), 11.5–73; **Effect of ionization on auroral particles** (Wentworth et al.), 11.5–152; **Upper air density** (Groves), 11.5–164, 11.5–165; **Satellite air density measurement** (Vassy), 11.5–166; **Upper atmos. data availability,** 11.5–167; **Charge and magnetic field effects on satellites** (Beard, Johnson), 11.5–171; **Satellite re-entry into the atmos.** (Nonweiler), 11.5–173; **Radioactivity in the atmosphere** (Morgenstern, Rentschler), 11.5–269.

11.5–268 532.59:551.510.5:551.524.7:551.596.1

Dikiĭ, L. A., **Ob akusticheskikh i gravitatsionnykh kolebaniiakh v atmosfere.** [Acoustic ...d gravitational oscillations in the atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. ...eofiz.*, No. 8:1186–1194, Aug. **1959.** 3 figs., 4 refs., 15 eqs. Russian summary p. 1186. **WB, DLC**—The study of wave motion in the temperature stratified (polytropic) atmosphere ... described with the mathematical analysis of the mean temperature gradient varying with ...ltitude. The wave motion is considered of the acoustic and gravitation types, similar to ...ose observed in the isothermal atmosphere. A mathematical analysis is carried out for ...eneral cases in the combined atmospheric conditions of two layers: polytropic troposphere and ...olytropic stratosphere. *Subject Headings:* **1. Acoustical propagation in atmosphere 2. Grav...y waves in atmosphere.**—*N.P.S.*

11.5–269 551.510.7:551.510.522

Morgenstern, W. and Rentschler, W., **Anteil "heisser Teilchen" an der Aktivität der ...odennahen Atmosphäre.** [Contribution of "hot particles" to the radioactivity of the ...tmosphere near ground level.] *Die Naturwissenschaften*, Berlin, 46(15):472–473, Aug. 15, **1959.** 2 figs., 5 refs. **DLC**—The knowledge of the contribution of the different particles in the ...otal radioactivity of the atmosphere near ground level is important to detect the danger ...esulting from the presence of artificial particles of high activity. A relation exists between ...ize and activity in the case of fission products and results of filter measurements made from ...Oct. 1958 to March 1959 are given. The most active particle detected had an activity of ...$.10^{-3}\mu$C. *Subject Headings:* **1. Radioactivity in the atmosphere 2. Artificial radioactivity.** —*A.V.*

RADIOACTIVITY

See: **IGY radioactivity program** (Machta, List), 11.5–17; **Sec. B6,** p. 672; **Radiation belt** (Van Allen), 11.5–151; **Radioactive ionization gages** (El-Moslimany, Spencer), 11.5–244.

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

11.5–270 551.511.33:551.558

T'u, Hsin-Yüan, **K voprosu ob urovne konvektsii.** [The problem of the level of convection.] *Meteorologiia i Gidrologiia*, Leningrad, No. 7:26–29, July **1959.** 3 figs., 4 refs., 9 eq **DWB, DLC**—The highest level to which overheated air particles rise is called the level of co vection. However, in literature and in the synoptical practice, the level of stabilization temperature of air particles with the temperature of the surroundings is erroneously consider the convection level. The author with thermodynamic analysis formulates the vertical upwa velocity (W), (without accounting for resistance), as a function of temperature and adiaba gradients and other parameters. The author further considers the turbulent resistance a thermal exchange of ambient temperature and formulas. The velocity equation is given nondimensional form. Computed results for various parameters are plotted in curves. *Subj Headings:* **1. Convection theories 2. Vertical current theories.**—*N.P.S.*

11.5–271 551.501:551.511.6:551.5

Barad, Morton L. (*GRD, AF Camb. Res. Center, Bedford, Mass.*), **Analysis of diffusi studies at O'Neill.** *Advances in Geophysics*, N. Y., Vol. 6, pub. **1959.** p. 389–398. 4 fig table, 6 refs., 4 eqs. **DWB, DLC**—The Taylor hypothesis has been applied to the diffusi measurements and the micrometeorological data gathered in Project Prairie Grass in order determine the Lagrangian correlation coefficient for lateral motion for time-lags correspondi to downwind travel of from 50 m to 800 m. In determining this coefficient it is necessary compute the second derivative with respect to time of the variance of the lateral distributi of mean concentration at points downwind from a continuous point source. An objecti technique for computing this derivative is described. A preliminary analysis of thirte experiments indicates that, for time-lags between about five and sixty seconds, the Lagrangi correlation coefficient R_L may exceed the Eulerian correlation coefficient R_E in some expe ments, be equal to it in others, and be less than it in still others. There is a tendency f $R_L - R_E$ to decrease as the mean wind speed decreases and as the stability ratio increase *Subject Headings:* **1. Project Prairie Grass 2. Diffusion studies 3. O'Neill, Nebr.**—*Autho abstract.*

11.5–272 551.511.6:551.551

Chiu, Wan-cheng, **The spectra of large-scale turbulent transfer of momentum and hea** N. Y., Univ. College of Engineering. Research Div. Dept. of Meteorology and Oceanograph Contract AF 19(604)-1755, Scientific Report No. 8, July **1959.** 24 p. 13 figs., 2 tables, refs., 3 eqs. **DWB**—The spectra of large scale eddy transfer of angular momentum and he were constructed for seven levels, ranging from 700 mb to 50 mb over Belmar, N. J., and at t 300 mb and 200 mb levels over Cocoa, Fla. It is found that the frequencies of motion whi were largely responsible for the eddy transport of heat, shift toward lower frequencies wi height. There was no such frequency shift indicated in the case of momentum transfer. T spectral intensity for the transport of angular momentum, when plotted against frequenc in general decreases with increasing frequency. The disturbances of long periods (say, long than 20 days) were found to play a role as important as those of shorter periods in contributi to the total eddy transport of both heat and momentum. *Subject Headings:* **1. Turbulen spectra 2. Large scale turbulence 3. Upper atmosphere turbulence 4. Turbulent transfe** —*Author's abstract.* Ⓢ

11.5–273 551.511.6:551.551.2:551.508.

Deacon, E. L. (*Div. of Met. Physics, C.S.I.R.O., Melbourne, Australia*), **The measureme of turbulent transfer in the lower atmosphere.** *Advances in Geophysics*, N. Y., Vol. 6, pu

59. p. 211–228. 5 figs., 2 tables, 19 refs., 8 eqs. **DWB, DLC**—Topics relating to the eddy rrelation method of measuring vertical transfer dealt with in this paper are: 1) the instru- ental response needed in eddy flux measurement; 2) the general degree of agreement between rious published studies on the heat flux; 3) progress with the automatic evaluation of eddy xes; 4) a suggested new method of measuring the fluxes specially suited to use at sea; further results on momentum transfer over the land. *Subject Headings:* **1. Turbulent transfer Vertical turbulent exchange.**—*Author's abstract.*

GENERAL CIRCULATION

See also: **Atmos. circulation anomalies** (Ballenzweig), **11.5–284.**

11.5–274 551.513:551.509.313

†Bryan, Kirk W., Jr., **A numerical investigation of certain features of the general circula- on.** Massachusetts Institute of Technology, Dept. of Meteorology, Contract AF 19(604)- 66, Scientific Report, No. 4, Dec. **1957.** 74 p. 9 figs., 3 tables, 26 refs., 51 eqs.—A two- yer, quasigeostrophic meteorological model containing a variable static stability and ap- roximations for nonadiabatic effects has been reduced to a constrained system in which most all large scale motions have been drained out. This experiment was subdivided and lutions of the derived numerical integrations of the first system were characterized by a roclinic wave of large amplitude in equilibrium with the zonal flow. The second group dicated the effect of a seasonal change in the overall static stability of temperatures. Future search in this field is advocated and might lead to the generation of an artificial climatological cord, a basis for theoretical experiments in statistical forecasting. *Subject Headings:* **General circulation 2. Numerical forecasting.**—*N.N.*

11.5–275 551.513.2(498)

Donciu, Const., **Variaţii ale circulaţiei aerului la sol in sudul R. P. R.** [Variations of the rface circulation in the southern part of Romania.] *Meteorologia Hidrologia şi Gospodarirea pelor*, Bucharest, 3(2/3):19–24, **1958.** 3 figs., 3 tables, 3 refs. English summary p. 137. **WB**—By comparing the frequency and speed means of the wind in different periods, it is tablished that in the south of Romania in the period 1931–1940, the prevailing circulation as in the E-W direction and with the lowest speed. In the previous period (1896–1915) the revailing circulation was NE-SW. Recent observations (1941–1955) show a return to this ter circulation. The observations made at Bucharest-Filaret uninterruptedly from 1889 to 955 show a wind pendulation with a half period of 30–35 years. The 1900–1909 decade has a inimal zonal circulation and the meridional components at the maximum; at the same time, ne speed of all the winds have the highest values. The decade 1931–1940 shows a maximum onal circulation and the lowest speed of the wind. The weakening of the meridional circula- on of this decade is explained by the weakening of the cyclonic activity. *Subject Headings:* **Meridional circulation variations 2. Zonal circulation 3. Romania.**—*Author's abstract.*

11.5–276 551.513.2:551.557.5

Ishimaru, Y., **Studies on the mean zonal flow, Pt. 1.** *Meteorological Society of Japan, okyo, Journal, Ser. 2*, 35(4):236–241, Aug. **1957.** 3 figs., table, 5 refs., 34 eqs. **DWB, DLC**— n this paper, the author considers the distribution of the zonal wind with constant absolute orticity, and remarks on the position of the jet stream. The vertical relative vorticity and its istribution on the globe is discussed in detail. The author's relationships contain ROSSBY'S nd KASAHARA'S results as its special cases. *Subject Headings:* **1. Zonal wind distribution . Jet stream location 3. Vertical relative vorticity.**—*Author's abstract.*

11.5–277 551.513.2:551.557.5

Terebelski, Jan, **Preliminary remarks on locating jet stream on constant pressure charts.** *rans World Airlines, Inc., Meteorological Technical Bulletin*, No. 56-3, Sept. 19, **1956.** 4 p. **WB**—Statements found in meteorological literature concerning various physical properties f the jet stream are listed for the benefit of analysts striving to locate the jet stream on constant

pressure charts. Most of the statements contain information about the structure of j streams and their usual position in relation to contours on upper air charts, tropopause heigh fronts, and other features in the circulation pattern. *Subject Headings:* **1. Jet stream locati 2. Constant pressure charts.**—*G.T.*

11.5–278 551.513.

Andrews, James F. (*Extended Forecast Sect., U. S. W. B., Wash., D. C.*), **The weather an circulation of May 1958: reversal from a long-period regime.** *Monthly Weather Revie* Wash., D. C., 86(5):177–185, May **1958.** 10 figs., 4 tables, 8 refs. **DWB**—May 1958 w characterized by reversal from a weather and circulation regime which had persisted sin January 1958. Such persistent regimes, lasting for a period of several months, are not u common and have been treated in previous articles of this series. The transition from weather pattern more characteristic of winter than spring actually began during April and w completely effected by May. This article describes the transition which occurred, treating more detail the reversal from April to May. The average monthly weather and its relati to the mean circulation are then discussed, followed by a comparison of tornado activity wi May of 1957 and a discussion of intramonthly changes in circulation and weather. *Subj Headings:* **1. Atmospheric circulation anomalies 2. Persistence 3. United States.**—*Autho abstract.*

11.5–279 551.513.

Frazier, Howard M. (*Extended Forecast Sect., U. S. W. B., Wash., D. C.*), **The weath and circulation of October 1957: month with a record low zonal index for October in t Western hemisphere.** *Monthly Weather Review*, Wash., D. C., 85(10):341–349, Oct. 19 9 figs., 3 tables, 11 refs. **DWB, DLC**—Blocking over N.W. North America and low zo index continued in October, resulting in greater 10-month precipitation at Billings, Pueb Denver, Dallas and Tampa than in any previous calendar year on record and record deficienc in the N.E. Tropical cyclones were at a minimum in the Atlantic and a maximum in the easte Pacific. Weekly circulation anomalies are discussed. The last week was unusually cold over the Plains and the East. *Subject Headings:* **1. Atmospheric circulation anomali 2. Blocking action 3. Western Hemisphere.**—*M.R.*

11.5–280 551.513.7(

§Green, Raymond A. (*U. S. W. B., Wash., D. C.*), **The weather and circulation of Mar 1958.** *Monthly Weather Review*, Wash., D. C., 86(3):100–107, March **1958.** 10 figs., 4 re **DWB, DLC**—Detailed weekly analysis of March 1958 weather shows features of circulati and upper air during a period when sustained cold and storms were observed in the southe plains and states from California to the Atlantic Coast, and the opposite extremes of warm and dryness in the northern U. S. Intense blocking occurred at high latitudes (near Huds Bay) and persisted throughout month to give greatest 700 mb monthly mean departure fr normal on record for March. *Subject Headings:* **1. Atmospheric circulation anomali 2. Weather and circulation—March 1958 3. United States.**—*M.R.*

11.5–281 551.513.7:551.577.

Woffinden, Charles M., **The weather and circulation of November 1957: stormy mon with a deep trough over Central North America.** *Monthly Weather Review*, Wash., D. 85(11):367–372, Nov. **1957.** 8 figs., 9 refs. **DWB**—The 700 mb zonal index for Nov. 19 was below normal for 5th successive month. Blocking was shifted to lower latitudes in t Atlantic and to higher latitudes in the Pacific. Intense cyclonic activity near Iceland duri Oct. gave way to blocking in that region in Nov.—a reversal of circulation. Weather w warmer in the Southeast. Numerous precip. records were broken (Cairo, Ill. had 13.05 Louisville 9.12″, etc. and Lander had 32.5″ snow). Concordia, Kan. had 10.2″ of snow Nov. 17–18. Dallas, Tex. had 53.00″ of rain in 11 months and San Antonio 47.91″ in t same period. *Subject Headings:* **1. Atmospheric circulation anomalies 2. Blocking acti 3. Record precipitation 4. Central North America.**—*M.R.*

ATMOSPHERIC DISTURBANCES

See also: **Transient barotropic ocean currents** (Robinson, Stommel), 11.5–208; **Pressure jump line** (Fraser), 11.5–302; **Polar front waves** (Hesstvedt), 11.5–325.

11.5–282 551.515:523.746

Bauer, F., **Neue Forschungsergebnisse über solare Einflüsse auf Wetter und Grosswetter.** [Recent results from researches on relations between sun and weather.] *Die Sterne*, Leipzig, (5/6):97–107, May/June **1959.** 3 tables, 7 refs. **DLC**—Although it has not been possible to find a 11-year correlation between solar activity and weather conditions, it seems possible to show the existence of other relationships: the dry summers in Germany, atmospheric pressure during summer in Copenhagen, differences between summer and winter air pressure in Asia, annual variation of pressure in the high pressure belt of the Southern Hemisphere and the annual growth of trees. These phenomena seem to present a double oscillation in the course of a sunspot cycle and a physical explanation is to be found. Variations of the solar constant, the influence of faculae and solar flares are considered. More detailed data concerning faculae and their area are needed for more detailed investigations. *Subject Heading:* **Sunspot cycle—weather relationships.**—*A. V.*

11.5–283 551.515:662.2:539.1

Frith, R. (*Brit. Met. Office*), **Thermo-nuclear explosions and the weather.** *Weather*, London, 14(4):140–142, April **1959.** 10 refs. **DWB, DLC.** Also issued in: *South African Journal of Science*, Johannesburg, 55(8):195–196, Aug. **1959.** 10 refs. **DWB, DLC**—Although out of 6 summers (1953–58) have been "bad" as far as weather goes in England, the year 55 was one of the best on record, and 1952 (before the first hydrogen bomb) was one of the first on record. In 1875–83, 7 out of 9 summers were bad, including 5 bad ones in a row. No physical explanation that is valid has been presented to give support to a conclusion that the climate has been or could be changed by nuclear explosions in the past or future. Even volcanic eruptions, which have put far more debris into the air than nuclear explosions, have not produced appreciable changes in climate such as are postulated by some writers for nuclear explosions. *Subject Heading:* **1. Nuclear explosion effects on weather.**—*M. R.*

11.5–284 551.515.2:551.513.7:551.509.322(261)

Ballenzweig, Emanuel M. (*Fleet Weather Facility, Norfolk*), **Relation of long-period circulation anomalies to tropical storm formation and motion.** *Journal of Meteorology*, Boston, 17(2):121–139, April **1959.** 16 figs., 26 refs. **Comment** by C. S. Ramage and **Reply** by Ballenzweig. *Ibid.*, 17(3):375–376, June **1960.** **DWB, DLC**—Tropical cyclone frequency in the entire North Atlantic and in the preferred sites of tropical cyclogenesis in the Atlantic undergo fluctuations which composite charts show to be related to the form and position of the planetary waves. Long-period conditions propitious for tropical storm formation in particular areas of the Atlantic show some rather well-defined circulation patterns which are not alike for all areas. These varying circulation patterns are also shown to form the framework for steering tropical cyclones after their generation. It is concluded feasible to use the various composite charts as guides in the preparation of long range forecasts of hurricane formation and motion. (Run from another source as 10.4–193, April 1959, *MAB.*) *Subject Headings:* **1. Long range hurricane forecasting 2. Atmospheric circulation anomalies 3. Tropical cyclone theories North Atlantic.**—*Author's abstract.*

11.5–285 551.515.2:551.509.318(94)

Newman, B. W. and Bath, A. T. (*both, Divisional Office, Brisbane*), **Occurrence of tropical depressions and cyclones in the northeastern Australian region during the season 1957–1958.** *Australian Meteorological Magazine*, Melbourne, No. 24:35–64, March **1959.** 5 maps. **DWB** This paper discusses the behavior, intensity and tracks of sixteen depressions over northeastern waters of Australia during the year ended June 30, 1958. Tentative synoptic experience gained in forecasting and in following the cyclone histories is given. *Subject Headings:* **1. Tropical cyclone studies 2. Synoptic analysis of tropical cyclones 3. Australia.**

11.5–286 551.515.21(75

Gangopadhyaya, M. (*Met. Service of India*) and Riehl, Herbert (*Univ. of Chic.*), **Exchan of heat, moisture, and momentum between Hurricane Ella (1958) and its environme** *Royal Meteorological Society, Quarterly Journal*, 85(365):278–286, July **1959.** 7 figs., 2 tabl 6 refs., 6 eqs. **Discussion** by J. S. Sawyer and R. C. Sutcliffe. *Ibid.*, 86(368):276, April **196 DWB, DLC.** Also issued in: *U. S. Weather Bureau, National Hurricane Research Proj Report*, No. 29, April **1959.** 12 p. 7 figs., 5 refs., 6 eqs. **DWB** (M15.2 U5845r)—On Sept. 1958, a tropical storm moved near the center of the network of upper-air observations in t Atlantic and Caribbean southeast of Florida. This made possible determination of the stru ture of the storm at a radius of 4.5° lat. from the center through the entire troposphere a computation of surface integrals concerning the exchange of heat, moisture, and momentu between the storm and its surroundings. It was found that the net heat export occurr indicating a net tropospheric drying and cooling after inclusion of radiation. The inwa transport of relative angular momentum was insufficient to balance the flux of angular mome tum to the ground as estimated from calculations for the mean hurricane. These computatio then suggested weakening of the disturbance with time, and this actually occurred. *Subj Headings:* **1. Hurricane "Ella" (1958) 2. Hurricane energy exchange 3. Florida.**—*Autho abstract*

11.5–287 551.515.21:551.5

Myers, Vance A. and Malkin, William (*both, Hydromet. Sect., Hydrologic Services Di U. S. W. B., Wash., D. C.*), **Why is the hurricane wind field asymmetrical?** Wash., D. C U. S. Weather Bureau, May **1959.** 13 p. 10 figs., 9 refs. "Paper to be presented at 40 Meeting of Amer. Geoph. Union and 176th Meeting of Amer. Met. Soc., May 7, 1959, Wash D. C." **DWB** (M15.22 U587wh)—The traditional view that the winds blow more strong on the right side of a hurricane than on the left because on one side the speeds of translati and rotation are additive, while on the other they are subtractive, has some validity as empirical description but is incomplete and erroneous as a dynamic explanation. A mo rigorous theory is offered, based on application of the equation of motion to trajectories of t air, with friction taken into account. Surface wind fields are computed for an idealized hur cane at different forward speeds. Various characteristics observed in the artificially co structed wind fields appear to be indicative of, and account for, features in observed hurrica wind fields. An immediately useful application is the reconstructing of surface wind fiel in an actual hurricane. *Subject Heading:* **1. Hurricane wind asymmetry.**—*Authors' abstract*

11.5–288 551.515.21:551.508.

Senn, H. V. and Hiser, H. W. (*both, Radar Met. Section, Marine Lab., Univ. of Miar Fla.*), **Note on the origin of hurricane radar spiral bands and the echoes which form the** *U. S. Weather Bureau, National Hurricane Research Project Report*, No. 26, Feb. **1959.** 16 9 figs., table, 10 refs. **DWB** (M15.2 U5845r)—Analysis of the histories of spiral rain ban as observed on radar indicates that they are usually formed near the center of the storm a propagate radially outward. The rainband, therefore, maintains a quasi-conservative positi relative to the quadrants in which it is formed and does not rotate about the storm cent Furthermore, the radar echoes are not simply pre-existing elements which assume the spi shape but appear to have their origin in the outward propagated band. Data from seve hurricanes are used to illustrate this hypothesis. Evidence is also presented which indica that the eye of the hurricane is defined by a wall cloud made up of one or more spiral ba fragments in the process of generation. *Subject Headings:* **1. Hurricane spiral bands on ra 2. Radar hurricane tracking.**—*Authors' abstract.*

11.5–289 551.515.

Battan, Louis J. (*Inst. Atmospheric Physics, U. Ariz.*), **Duration of tornadoes.** *Americ Meteorological Society, Bulletin*, 40(7):340–342, July **1959.** 2 figs., table, 2 refs. **DWB, DLC** Statistics on tornado path lengths have been examined, and estimates are made of avera path lengths and durations of individual tornadoes. *Subject Headings:* **1. Tornado trac 2. Tornado duration.**—*Author's abstract.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Cosmic radiation** (Hooper, Scharff), 11.5–7; **Solar energy utilization** (Spaulding), 11.5–36; **Radiation effects on plants** (Nisen), 11.5–49; **Radiation effects on animals** (Koniukhov, Chekeres), 11.5–51; **UV light effect on influenza virus** (Tischer), 11.5–67; **Solar proton stream models** (Bennett), 11.5–83; **Solar bursts** (Boischot et al.), 11.5–84; **Solar spectroscopy** (Michard), 11.5–95; **Spectra of solar eruptions** (Michard), 11.5–96; **Solar radiation brightness** (Hardie, Giclas), 11.5–108; **Solar corpuscular radiation** (Poloskov), 11.5–110; **Solar eclipses** (d'Anglejan-Chatillon, Dauvillier), 11.5–112; **Sec. D1,** p. 681; **Night airglow obs.** (Barbier), 11.5–125; **Terrestrial albedo** (Dauvillier), 11.5–128; **Night airglow emissions** (Dzhordzhio), 11.5–129; **Solar corpuscular emissions** (Malville), 11.5–130; **Auroral and twilight radiation, Antarctica** (Weill), 11.5–131; **Sec. D4,** p. 686; **Night airglow spectrum** (Beckers), 11.5–150; **Radiation belt** (Van Allen), 11.5–151; **Type IV solar emissions** (Avignon, Pick), 11.5–513; **Solar eruption-cosmic ray relationships** (Avignon, Pick), 11.5–154; **Solar flare phenomena** (Dodson), 11.5–157; **Solar radio brightness** (Minnis), 11.5–161; **Radio sources** (Mirto), 11.5–162; **Solar temp.** (Whitehurst, Mitchell), 11.5–163; **Radiation belt** (Pickering), 11.5–168; **Satellite cosmic ray obs.** (Rothwell, McIlwain), 11.5–169; **Glaciation** (Emiliani), 11.5–227; **Daylength effects on flowering** (Doorenbos), 11.5–320.

11.5–290 551.521:551.506.22

Mörikofer, W., **La recherche des rayonnements météorologiques pendant l'Année Géophysique Internationale.** [Research on meteorological radiation during the International Geophysical Year.] *Suisse Horlogère*, La Chaux-de-Fonds, 72(19):529–532, **1957. DLC**—Discusses importance of solar radiation as a source of biological and technical energy, main outlines of the economy of earth and atmosphere radiation, measurement equipment and radiation measurement program during the IGY in Switzerland. *Subject Headings:* **1. Radiation 2. IGY radiation program 3. Switzerland.**—*A. V.*

11.5–291 551.521.16:551.574.11

Verzár, F. and Evans, H. D. (*both, Univ. of Basel, Switzerland*), **Production of atmospheric condensation nuclei by sunrays.** *Geofisica Pura e Applicata*, Milan, 43:259–268, May/Aug. **1959.** 11 figs., 15 refs. German and English summaries p. 259. **DWB, DLC**—1) It is confirmed that in filtered, nucleus-free air, in a polyethylene balloon, if irradiated by sunlight, an immediate large number of condensation nuclei appear. 2) The nucleus count rises to about 25 000/cm³ and if the irradiation is continued does not increase, but decreases. This decrease is accelerated in the dark. 3) Less intensive sunlight, as when the sun was covered by clouds, gives slower and smaller increases. 4) The same was observed if, instead of air, industrial oxygen or nitrogen was used. 5) Traces of H_2S increase the sun effect enormously. 6) Traces of NH_3 also increase it, but less than H_2S. 7) SO_2 filtered through cottonwool also gave nuclei in the dark, which then decreased in number. 8) It is supposed that H_2S is oxydized by the photochemical action of the sun's visible spectrum to $SO_2 \rightarrow SO_3 \rightarrow SO_4$ which is a nucleus. With NH_3 the formation of $(NH_3)_2SO_4$ is probable. But no direct proof is given that these are the actual impurities which explain the sun's action on air. It is calculated that dilutions of 10^{-15} of an impurity of the type of H_2S can quantitatively explain the sun effect. 9) The work of AITKEN is extensively quoted, who noticed, 50 yrs ago, the "fog produced by sun." *Subject Headings:* **1. Sunlight effects on nuclei production 2. Nuclei and sunshine 3. Nuclei formation.**—*Authors' abstract.*

11.5–292 551.521.18

†Walshaw, C. D. (*Cavendish Lab., Cambridge*), **Infra-red radiation in the atmosphere.** *Science Progress*, London, 47(185):67–79, Jan. **1959.** 3 figs., 72 refs., 2 eqs. **DWB, DLC**—An excellent and lucid review of recent advances in measurement results and of measurement theory of atmospheric radiation in the long wave lengths. Windows in transmission or absorption due to H_2O, CO_2 and O_3 are discussed, and problems of calculation reviewed. Application to study of radiation budget, climatic changes, formation of the stratosphere.

and infrared detection are suggested. *Subject Heading:* **1. Infrared radiation in atmosphe** —*M.R.*

11.5–293 551.521.32:551.521.

Bolle, Hans-Jürgen, **Spektrale Messungen der infraroten atmosphärischen Gegenstra lung.** [Spectral measurements of the infrared emission of the atmosphere.] *Germa Deutscher Wetterdienst, Berichte,* 7(51):21–27, **1959.** 8 figs., 10 refs. German and Engli summaries p. 21. **DWB, DLC**—The infrared emission spectrum of the atmosphere is i vestigated by a single NaCl-prism-spectrograph in the spectral region between 4μ and 1 The instrument works in such a manner that with the frequency of 12 cps alternately t atmospheric radiation and the radiation of a black body of constant temperature pass through the optical system and hits the detector. The record corresponds to the spectrum the effective radiation of the black body against the sky. The atmospheric emission spectru itself can be computed by means of an absolute calibration. The dependence of the spectru on cloudiness, atmospheric water vapor content, and zenith distance is discussed. Ev within the so-called "absorption window" between 8μ and 13.5μ, in addition to the ozone ba at 9.6μ an emission spectrum can be pointed out, consisting of water vapor lines and a conti ous part. *Subject Heading:* **1. Infrared absorption spectrum.**—*Author's abstract.*

TEMPERATURE

See also: **Temp. effects on pines** (Parker), 11.5–57; **Desert heat tolerance** (Baker), 11.5–59; **Temp. effects on physiology** (Bobrov), 11.5–60; **Upper atmos. temps.** (Armstrong), 11.5–132.

11.5–294 551.524.37(7

*Friedman, Don G., **Frost survey of the Coachella Valley in Southern California.** *Travel Weather Research Center, Hartford, Connecticut, Occasional Papers in Meteorology,* No. 3, Ju **1959.** 136 p. 12 figs., 10 tables plus tables in appendix, 8 refs. **DWB** (M(055) T779oc) One hazard to Coachella Valley crops is the occasional occurrence of damaging frost in t winter season. The purpose of this study was to assemble the available information wh could be used to define the relative frost hazard in various sections of the Valley. Inasmu as "frost" damage can occur in the absence of ice crystals, air temperature was considered to a better criterion for measuring the extent of plant injury than the occurrence or nonoccurre of frost. Below freezing temperature records at all Coachella Valley stations were examin Most of the records were five years or less in length. The temperature record at Indio, Ca was found to be the longest and most complete. Consequently, Indio was used as a "ben mark" station and the long-term characteristics of below-freezing temperature occurrence the Coachella Valley were investigated using this 27 yr record. Low-temperature occurren at other Coachella Valley stations were then related to occurrences at the "bench mar station during a five year period. On the basis of these relationships, the frost hazard in various sections of the Coachella Valley were outlined. Both the minimum temperature a the duration that the temperature is below the critical temperature are important in determ ing the amount of frost damage to a particular crop. The critical temperature depends up a number of other weather and nonweather factors. Consequently, a single critical tempe ture cannot be defined. For this reason, the minimum temperature and duration in ho below three possible critical temperatures were used in this study. These data for all Coach Valley stations are tabulated in Appendixes A-F of this report. *Subject Headings:* **1. Fr hazard data 2. Coachella Valley, Calif.**—*Author's abstract.*

11.5–295 551.52

Booth, R. E., **Temperature gradient at Blackpool.** *Meteorological Magazine,* Lond 88(1,042):110–111, April **1959.** 2 tables, 2 refs. **DWB, DLC**—Members of the meteorolog stations at Blackpool Tower and Squires Gate undertook, during July 1956 through Janu 1957, a study of the mean monthly temperatures and compared the results with other stati in order to determine the differences in ground temperatures and those on the Tower.

mperature was usually higher on the Tower than it was at ground level during Nov.–Jan. other months it varied relative to the month. On the whole it was higher at ground level ring July, August and September. The temperature inversion during autumn mornings s noticeable in November. Temperature differences at these two places have been com- red with those of Rye and Leafield. *Subject Headings:* **1. Temperature gradient 2. Black- ol, Eng.**—*N.N.*

11.5–296 551.524.7:551.557(47,57/8)

*†Kochanski, Adam, **Temperatures and winds at 25–35 km over Russia in July 1957.** *U. S. ir Weather Service, Climatic Center, Technical Memorandum to the Director, CLIM CEN M-59-1,* Jan. 31, **1959.** 30 p. 22 figs., 11 tables, 16 refs. **DWB** (M24.7 K76te)—The eteorological conditions in July 1957 over European and Asiatic Russia are presented based the standard pressure level (30 mb) over the nation. From the tropopause the temperature creased with height up to at least 10 mb level. Above 100 mb temperature became higher ward the pole and lower toward the subtropical latitudes. The diurnal wind circulation in e 100 mb–10 mb layer was predominantly easterly with a strength that varied from 15 to kts. *Subject Headings:* **1. Upper air temperatures 2. Upper air winds 3. U.S.S.R.**—*N.N.*

11.5–297 551.524.7:551.547

Nania, Abele, **Indagine sulla relazione temperatura-altezza nelle superficie isobariche.** nvestigation of the temperature-altitude relationship at isobaric surfaces.] *Rivista di eteorologia Aeronautica*, Rome, 19(2):21–32, **1959.** 6 tables, 6 figs., 5 eqs. English summary 21. **DLC**—A short theoretical survey, supported by statistical data, concerning the relation- ip between temperature and altitude of main isobaric surfaces; practical applications are tlined. *Subject Headings:* **1. Temperature-altitude relationships 2. Isobaric surfaces.**— *uthor's abstract.*

11.5–298 551.524.731(73)

*Chiu, Wan-Cheng (*New York Univ.*), **The diurnal temperature variation of the lower ratosphere over the United States.** *Journal of Meteorology*, Boston, 16(4):354–363, Aug. 959. 4 figs., 3 tables, 18 refs., 8 eqs. **DWB, DLC**—From about five years (1952 to 1956) of adiosonde data over the U. S., taken by 15 radiosonde stations that had been conducting 4 bservations a day, the mean temperatures at the 4 observational hours were obtained sepa- ately for winter and summer at the 200 mb, 150 mb, 100 mb, and 50 mb levels of the strato- here. At each season and level (except the 50 mb level in winter), a diurnal temperature ariation was detected by plotting these mean temperatures for all the stations on one diagram gainst their appropriate local times of observations. After all the physical factors or errors n observations that might induce or influence the observed diurnal temperature variation ere carefully examined, it was estimated that about one quarter of the observed variation as real and the rest of it due to radiation error in observation. *Subject Headings:* **1. Diurnal tratospheric temperature variations 2. Radiosonde data 3. United States.**—*Author's bstract.*

SOIL TEMPERATURE

See also: **Remote measurement of soil temp.** (Golubev), 11.5–12.

11.5–299 551.525.4(941)

Mason, B. (*Divisional Office, Adelaide*), **Soil temperatures—Giles, Western Australia.** *ustralian Meteorological Magazine*, Melbourne, No. 24:10–20, March **1959.** 2 figs., 3 tables, refs. **Comment** by Willem van der Bijl and **Reply** by Mason. *Ibid.*, No. 28:43–45, March **960. DWB**—Monthly mean soil temperatures at various depths up to 40 in. at a desert tation (Giles) during 1957 are presented. The diurnal variation, direction of heat flow and he thermal diffusivity of the soil are discussed. It is also shown that a rainfall of 4½ in. in December would have had little effect on the regeneration of pastures due to the rapid drying ut and the return of high temperatures in the top layers of the soil. *Subject Headings:* **1. Soil emperature data 2. Giles, Western Australia.**

11.5–300 551.525.4:551.508.2

Salaruddin, M. (*Met. Off., Poona*), **A portable instrument for determining soil temperatur at various depths.** *Indian Journal of Meteorology and Geophysics*, Delhi, 10(2):199–20 April **1959.** fig., table, 2 refs. **DWB, DLC**—A portable instrument using thermocouples fo measuring soil temperatures has been designed and constructed. The instrument as con structed can record temperatures at depths of 5, 10, 15 and 30 cm and also at depths of 10, 1 20 and 35 or 15, 20, 25 and 40 cm by inserting it into the soil to different points. The in strument can be installed by simply driving it into the soil without materially disturbing th soil packing or the vegetation cover and reliable readings can be obtained within a short tim of its insertion unlike in the case of ordinary soil thermometers. *Subject Heading:* **1. Soc temperature instruments.**—*Author's abstract.*

PRESSURE AND WIND

PRESSURE

See: **Northern Hemisphere pressure charts** (Lahey et al.), 11.5–13; **Coriolis effect on edge waves** (Reid), 11.5–200; **Coriolis effect on edge waves** (Kajiura), 11.5–201; **Pressure-altitude relationships** (Rouand), 11.5–257; **Temp.-altitude relationships at isobaric surfaces** (Nania), 11.5–297; **Wind speed vs. pressure gradient** (Dexter), 11.5–301; **Pressure jump line** (Fraser), 11.5–302.

TURBULENCE

See: **Diffusion studies** (Barad), 11.5–271; **Turbulence spectra** (Chiu), 11.5–272.

WIND DISTRIBUTION AND VARIATIONS

See also: **Coriolis effect on edge waves** (Reid), 11.5–200; **Coriolis effect on edge waves** (Kajiura), 11.5–201; **Hurricane wind asymmetry** (Myers, Malkin), 11.5–287.

11.5–301 551.553:551.557.3:551.542.1(716

Dexter, R. V., **Preliminary report on winter wind speed versus pressure gradient at se off the Nova Scotia coast.** *Canada. Meteorological Branch, CIR*-3213, TEC-304, June 1 **1959.** 17 p. 5 figs., 10 refs. **DWB**—The reported wind speeds for November and Decembe 1958, and January and February, 1959, at Sambro Lightship, off Halifax, N.S., and Lurche Lightship, off Yarmouth, N.S., are compared with the geostrophic wind speeds as indicate by the synoptic charts prepared by the Dominion Public Weather Office at Halifax. Th relation between the observed wind speeds and the geostrophic wind speeds is shown to b dependent upon the speed and direction of the geostrophic wind. This relation does not agre quantitatively with values quoted in standard meteorological publications. In particula the observed winds are much stronger than one would expect, and they frequently exceed th geostrophic gradient. Charts are constructed as an aid in forecasting wind speeds off th Nova Scotia coast. *Subject Headings:* **1. Wind-geostrophic wind speed relationships 2. Ge strophic gradient wind deviations 3. Wind speed forecasting 4. Nova Scotia.**—*Autho abstract.*

SPECIAL WINDS AND WIND EFFECTS

See also: **Föhn sickness** (Halhuber), 11.5–62; **Wind induced waves** (Walden), 11.5–203; **Undertow currents** (Rivière, Vernhet), 11.5–207.

11.5–302 551.555.4:551.541:551.515.8(712.

Fraser, D. B., **Unstable character of northeasterly winds at Resolute, N.W.T.** *Canad Meteorological Branch, CIR*-3189, TEC-300, April 24, **1959.** 11 p. 4 figs., 3 tables, 7 ref 9 eqs. **DWB**—Surface winds at Resolute, N.W.T., are frequently extremely unsteady duri periods of moderate to strong northeasterly flow aloft. Strong north-northeasterly surfa

winds are sometimes interrupted by calms which begin and end so abruptly as to present a hazard to aviation. An explanation of this phenomenon is presented in terms of a theory of katabatic winds developed by Ball. Northeasterly gradient winds at Resolute are reinforced by a strong katabatic flow off a range of hills immediately east to northeast of the airstrip. When the katabatic flow is confined to a surface layer surmounted by a strong inversion, a jump line may develop at some point on the slope or downstream from it. At the jump, the downflowing cold air undergoes an abrupt increase in depth and decrease in velocity. Landward or seaward motion of the jump line over Resolute causes sudden changes in surface wind conditions. The theory gives a good qualitative explanation of the observed phenomenon and quantitative results are of the right order of magnitude. However, the detailed structure of the flow is unknown due to the lack of observations of wind and temperature to landward and seaward of the station. *Subject Headings:* **1. Katabatic winds 2. Northeasterly gradient winds 3. Pressure jump line 4. Resolute, N.W.T.**—*Author's abstract.*

UPPER AIR WINDS AND VERTICAL MOTION

See also: **Upper wind measurement** (Ervet, Robuchon), 11.5–258; **Upper wind measurement** (Marc et al.), 11.5–259; **Vertical current theories** (Du), 11.5–270; **Zonal wind distribution** (Ishimaru), 11.5–276; **Jet stream location** (Terebelski), 11.5–277; **Upper air winds** (Kochanski), 11.5–296; **Wind speed vs. pressure gradient** (Dexter), 11.5–301.

11.5–303 551.558.1:551.510.522

Johnson, O. (*Met. Service of Canada*), **An examination of the vertical wind profile in the lowest layers of the atmosphere.** *Journal of Meteorology*, Boston, 16(2):144–148, April **1959.** 5 figs., 2 tables, 6 refs. **DWB, DLC**—Wind profile measurements from ½ to 16 m above ground over prairie grass and over a snow surface at the Suffield Experimental Station and from 2 to 16 m over short grass at O'Neill, Neb., have been analyzed in order to determine the relative accuracy of the logarithmic and power-law representation of the variation of wind speed with height. It was found that over prairie grass and over a snow surface the wind speed increased more rapidly than predicted by a simple power law. The O'Neill data were represented equally well by the two laws under adiabatic and lapse conditions, while the power law represented the data better under inversion conditions. *Subject Headings:* **1. Vertical wind profiles 2. Wind velocity variations.**—*Author's abstract.*

AQUEOUS VAPOR, HYDROMETEORS AND HYDROMETEOROLOGY

HUMIDITY

See: **Moisture determination in wheat milling** (Soenen, Schuchewytsch), 11.5–72.

CONDENSATION

See also: **Aerosol mechanics** (Fuks), 11.5–4; **Icing of aircraft** (Knowler), 11.5–39; **Ice prevention on aircraft windows,** 11.5–40; **Ice accretion on aircraft** (Srinivasan), 11.5–41; **Condensation nuclei** (Facy), 11.5–262; **Condensation nuclei** (Katz), 11.5–263; **Condensation nuclei formation** (Verzár, Evans), 11.5–291; **Elec. charges on aerosols** (Mühleisen), 11.5–330.

11.5–304 551.574.11:551.501

†Georgii, Hans-Walter, **Probleme und Stand der Erforschung des atmosphärischen Aerosols (Einleitendes Referat.)** [Problems and state of atmospheric aerosol research: introduction]. *Germany. Deutscher Wetterdienst, Berichte*, 7(51):44–52, **1959.** 6 figs., 49 refs. German and English summaries p. 44. **DWB, DLC**—The following paper summarizes the main results of the investigations of natural atmospheric aerosols during the last

years. The size-distribution law showed that particles of definite size-ranges are importan for the different sections of meteorological research. The paper deals further with the im provements of the technique of counting and sizing the aerosol-particles. The detailed investigation of continental particles by Junge proved that these are mainly "mixed" particles This result is valid for a broad size-range of the aerosol. With regard to the maritime aeroso the mechanism of formation of sea-salt particles were completed by direct analyses of the com position of the nuclei. The results of these studies together with measurements of atmospheri trace-gases permit an estimation of the total budget of trace-substances in the troposphere *Subject Headings:* **1. Aerosol size distribution 2. Nuclei sampling methods.**—*Author's abstrac*

11.5–305 551.574.12:551.594.2

Magono, Choji and Takahashi, Tsutomu (*both, Hokkaido Univ., Sapporo*), **The electri charge on condensate and water droplets.** *Journal of Meteorology*, Boston, 16(2):167–17 April **1959.** 10 figs., 9 refs. **DWB, DLC**—It was found that dew produced artificially on thin wire was electrified negatively when the water temperature of the reservoir for supplyin water vapor was lower than about 80C and positively when the temperature was higher tha about 85C. The electrification phenomena of the condensate were considered to be originate from the electric charge on individual water droplets, because it was observed that the droplet were electrified when they rose from the water surface of the reservoir, and the sign of charg on the individual droplets agreed well with that of the condensate. *Subject Headings:* **1. Arti ficial condensation 2. Electrical charges on drops 3. Electrical properties of dew.**—*Author abstract.*

FOG AND CLOUDS

See: **Cloud structure** (Knowler), 11.5–39; **Precip. from nonfreezing clouds** (Facy), 11.5–306; **Elec. charges on fog** (Mühleisen), 11.5–330.

PRECIPITATION

See also: **Maximum possible precip.,** 11.5–23; **Rainfall effects on cotton culture, Nigeria** (Manning), 11.5–48; **Rainfall effect on butterfat production** (Mitchell), 11.5–71; **Radioactive precip.** (Mageru et al.), 11.5–74; **Precip. measurement instructions,** 11.5–245; **Bouet's similarity index** (Sneyers), 11.5–247; **Record precip.** (Woffinden), 11.5–281.

11.5–306 551.577.11:551.576.12(21

Facy, Léopold, **Sur la genèse des précipitations dans certains nuages chauds.** [Precipit tion formation in certain nonfreezing clouds.] *Geofisica e Meteorologia*, Genoa, 7(1/2):7–1 Jan./April **1959.** 3 figs. **DWB**—The author points out that certain averagely develope cumulus clouds formed in tropical maritime air can precipitate as the result of high wat content in the upper parts of the clouds. In stratus clouds of the frontal type, in which th sedimentation of droplets is no longer almost negligible before the speed of ascent, the formatio above the cloud of a clear supersaturated space free of condensation nuclei permits, beginnin with seeding through the top, the extremely rapid growth of droplets capable of increasing size by coalescence. While valid for warm clouds this mechanism is applicable also to clou with negative temperatures thus concurring with the process of BERGERON; it provides th a simple explanation for the formation of radar echoes of the socalled "upper band." *Subje Headings:* **1. Precipitation from tropical cumuli 2. Warm cloud rainfall.**—*I.L.D.*

11.5–307 551.577.2:551.43(444.

Berger, E. and Chaussard, M., **Étude sur la répartition des précipitations dans le Départ ment du Jura en fonction de l'altitude.** [Study of the distribution of precipitation in t Department of Jura as a function of altitude.] *Revue de Géographie Alpine*, Grenoble, 47(1 97–102, 1959. 6 figs. **DWB**—A study has been made of the complex climatological facto that exist in the French province of Jura where there are chains of mountains, plateaus a plains of varying altitudes. The meteorological differences contributing toward the over- average annual rainfall and precipitation in the region during the summer, winter and autu

months are accounted for. Temperature, wind and other factor differences during 1949, 1953, 1957 and 1958, are compared with those of earlier years. *Subject Headings:* **1. Precipitation distribution 2. Orographic rainfall 3. Jura, France.**—*N.N.*

11.5–308 551.577.21:551.579.4:551.481.1(766)

*Harbeck, G. Earl, Jr. and Coffay, Ethel W. (*both, U. S. Geological Surv., Dept. Int., Denver*), **A comparison of rainfall data obtained from rain-gage measurements and changes in lake levels.** *American Meteorological Society, Bulletin*, 40(7):348–351, July 1959. 3 figs., table, 6 refs., eq. **DWB, DLC**—During the Lake Hefner evaporation studies of 1950–1951, changes in lake stage were measured with great accuracy. Rainfall records were obtained using a network of 22 standard 8-in. rain gages. In the present study, the lake was considered to be an immense rain gage, and the changes in lake stage were used as a measure of the rainfall. A comparison was then made with the average catch of the 22 rain gages around and on the lake. This catch was 10% less than the rise in stage of the lake. The data indicate that strong winds reduce the catch in the rain gages. *Subject Headings:* **1. Lake level variations 2. Rain gage networks 3. Rainfall amount 4. Rain gage errors 5. Lake Hefner, Okla.**—*Authors' abstract.*

11.5–309 551.579:551.577.37/8:627.1

Thomas, H. E. (*U. S. Geological Survey*), **Reservoirs to match our climatic fluctuations.** *American Meteorological Society, Bulletin*, 40(5):240–249, May 1959. 5 figs., 5 refs. **DWB, DLC**—Alternating wet and dry periods, each of several years' duration, are suggested by the records of precipitation at several localities in the southwestern U. S., and they are indicated also by the records of natural streamflow. In some regions, the precipitation and runoff since 1930 have been at a significantly lesser rate than in the quarter-century prior to 1930, and in most of the Southwest drought has been prevalent since about 1945. A large proportion of the precipitation stations and stream-gaging stations in the Southwest have been established subsequent to 1930, and records from them are likely to be too short to indicate the climatic norm. Reservoirs, both surface and subsurface, can smooth out the marked daily, seasonal, and annual variations in water supply from precipitation, and can furnish water at rates more nearly in accordance with human needs. Many ground-water reservoirs, and some surface reservoirs, after being well filled during years of abundant precipitation and runoff, have provided an adequate supply of water during several successive years of drought. In the protracted drought periods that have been recorded in the Southwest, however, storage in most reservoirs has been depleted seriously, and the actual yield of some of them has been significantly less than the computed long-term average yield. Maintenance of a relatively constant yield throughout protracted wet and dry periods would require reservoirs having large storage capacity and losing as little water as possible by evaporation or other natural discharge; accurate evaluation of the long-term average inflow is a prerequisite to successful utilization of the reservoirs. *Subject Headings:* **1. Dry and wet spells 2. Water budget 3. Reservoirs and water resource fluctuations 4. Southwest United States.**—*Author's abstract.*

11.5–310 551.577.37:551.311:631.4

Wischmeier, Walter H., **Rainfall erosion index for a universal soil-loss equation.** *Soil Science Society of America, Proceedings*, 23(3):246–249, May/June 1959. 4 figs., 10 refs. **DWB, DA**—Extensive regression analyses of basic soil-loss data were designed to determine the best indicator of the capacity of a storm to erode soil. The rainstorm characteristic found to be outstanding as such an indicator is the variable whose value is the product of the rainfall energy and maximum 30-minute intensity of the storm (designated as EI). This variable explained from 72 to 97% of the variation in individual-storm erosion from tilled continuous fallow on 6 soils. Seasonal rainfall erosion index values computed by adding the EI values of storms >0.5 inch explained as high as 94% of the yearly deviation in total soil loss from fallow during the summer season. Tested against data from plots in continuous row crop for 10 or more years at each of four widely separated locations, the summed EI values explained from 72 to 85% of the yearly variation in soil loss within corresponding cover periods. Expected annual values of the index and seasonal distribution of the erosion potential may be readily computed from local rainfall records. This has been done for 60 locations in the 31

Eastern States. About 8,000 plot-years of basic erosion data are being analyzed to evalua factors for a universal soil-loss equation for which the erosion potential of expected loc rainfall serves as the base. Tests show that estimates of average erosion losses computed this manner are sufficiently accurate to serve as sound bases for conservation farm plannin *Subject Headings:* **1. Soil erosion 2. Rainfall erosion index 3. Rainfall intensities 4. Easte United States.**—*Author's abstract.*

11.5–311 551.577.38:628

Wood, George W. (*Board of Water Commissioners, New Britain, Conn.*), **The experienc of New Britain with the 1957 drought.** *New England Water Works Association, Journa* 73(1):15–22, March 1959. 2 tables, chart (fold.). **DWB, DLC**—The serious drought Connecticut in 1957 did not disrupt domestic and industrial activities of New Britain becau water was drawn from Shuttle Meadow, Wolcott reservoirs, as well as from a supply at Whi Bridge and other reservoirs. A total storage capacity of 1530 mil. gal. could be obtained fro all the existing reservoirs. Average daily consumption during the past years and that of 19 are compared percent wise. *Subject Headings:* **1. Water supply 2. Drought, Connecticu (1957) 3. New Britain, Conn.**—*N.N.*

RAIN, SNOW AND HAIL

See also: **Hail prevention** (Facy), 11.5–262; **Hail prevention, Switzerland** (Katz), 11.5–263; **Hail prevention, Germany** (Müller), 11.5–264; **Hail prevention, Italy** (Roncali), 11.5–265; **Hail prevention, Austria** (Steinhauser, Friedrich), 11.5–266; **Hail prevention, Switzerland** (Thams), 11.5–267; **Elec. charges on raindrops** (Jolivet), 11.5–332.

11.5–312 551.578.

Kelkar, V. N. (*Dept. Physics, Nowrosjee Wadia Coll. Poona*), **Size distribution of raindrop Pt. 1.** *Indian Journal of Meteorology and Geophysics*, Delhi, 10(2):125–136, April 195 9 figs., 2 tables, 3 refs., charts in appendix. **DWB, DLC**—Results of mea urements of the size distribution of raindrops made at Poona during the months of August, Sep tember and October 1956, are reported in the form of a table showing the number of dro received at the ground level per m^2 per sec for various ranges of diameter at 0.25 mm interval, f different intensities of precipitation ranging from 0 to 40 mm hr^{-1}. Average values have bee calculated and presented in the form of a similar table. Histograms showing the number, volun of liquid water, momentum and kinetic energy of raindrops per m^2 per sec, against the raindr number N, momentum M and kinetic energy E (in joules) of raindrops per m^2 per sec wi intensity of precipitation is shown graphically. By the method of least squares the followi relations are obtained: $N=710\ I^{0.47}$, $M=165\ I$, and $E=2.8\times10^{-3}\ I^{1.18}$, where I is the intensit of precipitation in mm hr^{-1}. The results are presented in a form suitable for soil erosi problems. The data are confined to general rains. *Subject Headings:* **1. Raindrop si distribution measurements 2. Poona, India.**—*Author's abstract.*

11.5–313 551.578.

Siksna, R., **The electrolytical conductivity of precipitation water as an aid to the chemic analysis.** *Geofisica Pura e Applicata*, Milan, 42:32–41, 1959. 6 figs., 4 tables, 4 refs. Germa and English summaries p. 32. **DLC**—The possibility of the use of measurements of t electrolytical conductivity of precipitation water as an aid to its chemical analysis has be examined. The measured conductivity of rainwater and of water obtained by melting sn and rime was of the order of magnitude of that for more or less good distilled water, with so exceptions. Considerable variations of the conductivity of rainwater continuously measur during rainfalls were observed. The relation between the conductivity and the chemic composition of the precipitation water was discussed by using the data of the Scandinavi precipitation-chemistry project. The importance of pH measurements was also shown this consideration. *Subject Headings:* **1. Rainwater analysis 2. Conductivity of rain wat 3. Electrolytic nuclei.**—*Author's abstract.*

HYDROMETEOROLOGY

See: **Crop-water relations of cotton, Nigeria** (Manning), 11.5-48; **Fluid flow in porous media** (Rose), 11.5–222; **Stream flow routing, Columbia Basin** (Rockwood), 11.5–223; **Runoff data, Norway,** 11.5–225; **Lake level variations** (Harbeck, Coffay), 11.5–308.

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See: **Climatology symposia,** 11.5–26; **Planetary climates** (Richardson), 11.5–109; **Climagrams** (Matějka), 11.5–246.

CLIMATE OF PARTICULAR PLACES

See also: **Climate of western Lake Erie** (Langlois), 11.5–2; **Climate of Linz** (Lauscher et al.), 11.5–6; **Climatic charts, Pakistan** (Grimes), 11.5–38; **Climatic summaries, Netherlands** (ten Kate), 11.5–252; **Met. data, Suntar-Khayata range** (Kliukin), 11.5–253; **Climate-altitude relationships, southern Appalachians** (Dickson), 11.5–321.

11.5–314 551.582.3:551.585(497.2)

Sŭbev, L. and Stanev, Sv., **Klimatichnite raĭoni v Bŭlgariia i tekhniiat klimat.** [Climatic regions of Bulgaria and their climate.] *Khidrologiia i Meteorologiia,* Sofia, No. 3:3–21, **1959.** Ig., 7 refs. Russian and English summaries p. 21. **DLC**—The authors state the methodology which they have followed and the facts which they have taken into consideration in carrying out the climatic classification of Bulgaria in 1957. A map in the climatic atlas of Bulgaria was the result of this work. A small format version of the map is included in this paper and the climates of the individual climatic districts, subdistricts and regions of the country are briefly described. *Subject Headings:* **1. Climate of Bulgaria 2. Climatic classification 3. Bulgaria.**—*Authors' abstract.*

CLIMATIC CHANGES

See also: **Seasonal effects on butterfat production** (Mitchell), 11.5–71; **Glacier retreat and climatic change** (Barnier), 11.5–226; **Glacier variations, Central Asia** (Zabirov), 11.5–233.

11.5–315 551.583:581.056 539.16:546.26:634.94

Whitaker, William W.; Valastro, S., Jr. and Williams, Milton (*all, Humble Oil & Refining Co., Houston, Texas*), **The climatic factor in the radiocarbon content of woods.** *Journal of Geophysical Research,* Wash., D. C., 64(8):1023–1029, Aug. **1959.** 2 figs., 2 tables, 8 refs. **DLC**—Past research has shown significant variations in radiocarbon contents of woods from different environments and in the degrees to which these radiocarbon contents reflect dilution of atmospheric carbon dioxide by carbon dioxide from fossil fuels. The present work attempts to relate these variations to climatic factors. Comparison of radiocarbon contents of individual tree rings with thicknesses of the rings and, in some cases, with meteorological records suggests that the radiocarbon contents of rings produced in years of heavy rainfall may be relatively low and that the contents of rings added in times of drought may be comparatively high. The year-to-year fluctuations in radiocarbon content observed in individual trees probably cannot be ascribed to rainfall alone, but likely also depend upon other factors. The apparent dependence of radiocarbon content on climate seems to be a result of a varying contribution to the tree of carbon from the pedosphere. *Subject Headings:* **1. Radiocarbon in trees 2. Climatic influences on radiocarbon.**—*Authors' abstract.*

11.5–316 551.311:551.583.14

Dresch, J., **Notes sur la géomorphologie de l'Air.** [Notes on the geomorphology of the Air.] *Association des Géographes Français, Paris, Bulletin* No. 280/281:2–20, Jan./Feb. **1959.**

6 figs. **DLC**—Geomorphological study of the crystalline Aïr Mountain (southward pro longation of the Ahaggar) through analysis of the top deposits and the surfaces. Autho examines the role of soil motion and the influence of alternate wet and dry periods. A parall is drawn between this alternation and geomorphological evolution of the region. A chro nology is set forth, with the following stages: a) levelling through sedimentation; b) hollowin of the koris valleys during a dryer phase, as a result of soil motion; c) wide scattering of drif boulders during a wet period coming after an arid one; d) completely dry climate (upper Paleolithic); e) a final alternation of wet and then dry, accounting for the patina of the bar crystalline rocks. This sequence shows that the Aïr's morphology must be considered in th framework of the tropical zone. *Subject Headings:* **1. Geomorphology of arid lands 2. Climati trends 3. Dry and wet climate alternation 4. Aïr Mountain, French West Africa.**—*A. V.*

11.5–317 550.382.3:525.3:551.583.

†Flohn, Hermann (*Deut. Wetterdienst, Zentralamt, Offenbach/M*), **Kontinental-Verschie bungen, Polwanderungen und Vorzeitklimate im Lichte paläomagnetischer Messergebnisse** [Continental drift, displacements of the pole, and prehistoric climate in the light of paleo magnetic measurements.] *Naturwissenschaftliche Rundschau*, Stuttgart, 12(10):375–384 Oct. 1959. 8 figs., table, 14 refs. **DWB, DLC**—In this comprehensive account of the natur of paleoclimates and its variation as indicated by paleomagnetic evidence, the author discusse the nature of the phenomenon of paleomagnetism, including its magnetization by induction by the earth's magnetic field and by cooling of volcanic rocks; the earth's magnetic field an its secular variation; the Arctic anomaly of the magnetic field; paleomagnetic dates and thei interpretation; the various hypothesis explaining climatic changes in the geologic past and reconstruction of the atmospheric circulation in the case of an ice free polar sea. Paleomagneti measurements of European and North American rocks provide evidence for a migration of th North Pole from its position in the late Paleozoic in East Asia over Siberia to its presen position. A satisfactory agreement of polar paths is obtained when both contents are allowe to approach each other by 25° of longitude during the Paleozoic. No definite deviations fro the present position of the pole could be ascertained during the late Tertiary and Pleistocene The present secular displacement of the rotation pole corresponds to the direction of migratio (toward Hudson Bay), while the velocity of 15 cm/year is about five times as large as the valu of the velocity during the past two hundred million years. The continents of Gondevana lan were situated more closely to one another during the Carboniferous than today, so that th South Pole was in South Africa and somewhat off central Australia. The climate of Centra and West Europe corresponded during the Carboniferous to the equatorial rain zone; th Permian to the summer region of the subtropics with trade winds from the southeast; in th Mesozoic to the warm arid subtropics, in the Tertiary to the Mediterranean winter rain zon with initially high and later decreasing temperatures. A circulation model for an ice fre polar sea provides a displacement of atmospheric westerly drift by at least 20% in winter a against 3% in summer; a diminution of frequency of rapid cyclogenesis in dynamically unstabl frontal zones and an increase of the earth's mean temperature by +4°C. *Subject Heading* **1. Continental drift 2. Polar displacement 3. Paleomagnetism 4. Prehistoric climates.**— *Author's conclusions & I.L.D.*

11.5–318 551.583

Kraus, E. B. (*Snowy Mts. Hydro-electric Authority, Cooma, N. S. W.*), **Synoptic an dynamic aspects of climatic change.** *Royal Meteorological Society, Quarterly Journal*, 86(367 1–15, Jan. 1960. fig., 43 refs. **DWB, DLC**—The changing pattern of world climate durin the last hundred years is compared with the infrared pattern of the Pleistocene. Relative cool climates at high latitudes appear to have been associated much of the time with reduce tropical sea surface temperatures, a lower snow line on tropical mountains, reduced aridit on the desert fringes and increased storm activity along continental east coasts in midd latitudes. Relatively warm climates at high latitudes tend to be associated with the opposi complex of conditions. Considerations of the water balance suggest that a small temperatu decrease would be necessary and sufficient for the re-establishment of glacial conditions many regions. Increased snowfall would help but is not essential. Synoptic considerations indicate that glaciation was associated necessarily with strong upper westerlies at relative

row latitudes over the continents and probably with vigorous anticyclones over the subtropical oceans. An increased infrared cooling rate in the upper air, particularly over the tropics, could produce all the necessary conditions for the establishment of a glacial/pluvial phase. Possible causes for changes in the infrared cooling rate are discussed. *Subject Headings:* **1. Climatic changes 2. Infrared cooling rate.**—*Author's summary.*

MICROCLIMATOLOGY

See: **Mesoclimatology** (Pierre), 11.5–5.

CLIMATIC CLASSIFICATION

See also: **Mesoclimatology** (Pierre), 11.5–5; **Alpine met.,** 11.5–25; **Desert heat tolerance** (Baker), 11.5–59; **Climat. classification, Bulgaria** (Sŭbev, Stanev), 11.5–314; **Dynamic climat. classification** (Giao), 11.5–322.

11.5–319 551.585(477):63

Sapozhnikova, S. A., **Agroklimaticheskie zony Ukrainy.** [Agroclimatic regions of the Ukraine.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy,* No. 14:3–9, **1958.** 2 figs., table, 11 refs. **DWB**—The climatic classification of the Ukraine, developed by the author, is based upon the use of atmospheric temperature summations for the period with temperatures above 10°C, upon the hydrothermal coefficient of SELIANINOV for the period with temperature above 10°C, and upon the mean absolute annual minimum of air tamperature for characterizing winter conditions. On the basis of the hydrothermal coefficient, the Ukraine is divided into 4 principal zones, namely: humid, (HTC > 1.3), insufficiently humid (HTC = 1.3 − 1.0), arid (HTC = 1.0 − 0.7) and very arid (HTC = 0.7 − 0.4) and two regions with vertical zonation: the Carpathians and the northern slopes of the Crimean mountains. Since humidity cannot serve as a basis for absolute agroclimatic boundaries, the establishment of the latter was carried out with the aid of natural zones based upon soil classifications and long period agricultural experience. Except for the humid zone, which has a considerable expanse from north to south and is influenced by mountains and elevations, the remaining zones parallel the variations in the thermal regime. Thus the insufficiently humid zone is a warm zone (Σt 2500–2900°); the arid is a moderately warm zone (Σt 2900–3300°) and the very dry is a very hot zone (Σt 3300–3400°C). Further agroclimatic subdivision of the territory is possible on the basis of the temperature regimes within the humid zone and on the basis of specific agricultural crop and agricultural procedures. The farm crops and practices associated with the various humid zones and their subzones are described. A map showing the agroclimatic zones of the Ukrainian SSR and a table with climatic data for individual localities in Poland and the Ukraine are presented. *Subject Headings:* **1. Agroclimatic regions 2. Climatic classification 3. Ukrainian S.S.R.**—*I.L.D.*

BIOCLIMATOLOGY

See also: **Sec. B2,** p. 664; **Sec. B4,** p. 668.

11.5–320 551.586:551.521.16:581.14

Doorenbos, J., **Response of China aster to daylength and gibberellic acid.** *Euphytica* Wageningen, 8(1):69–75, Feb. **1959.** 2 figs., table, ref. **DA, PU**—1) Plants of *Callistephus chinensis* vs. "Giant Comet" were subjected to photoperiods of 8 to 16 hrs. In a short day (SD) a much greater number of leaves was formed than in a long day (LD) before the terminal inflorescence was initiated. By transferring plants from LD to SD at weekly intervals it was determined that in LD floral induction is completed about 6 wks after sowing. 2) Inflorescence development proceeds faster in SD than in LD. Plants in continuous SD or LD flower almost simultaneously. Plants transferred from LD to SD 6 wks after sowing, flower about a month earlier than those plants grown entirely in LD. 3) Gibberellic acid (GA_3) did not affect inflorescence initiation in LD. In SD, however, GA_3 applications reduced the number of leaves formed before inflorescence. The maximum effect, obtained by spraying with a solution of 25 mg GA_3/l for 30 days, halved the difference in leaf number of untreated plants in LD and

SD. The same effect was obtained when plants were sprayed 10, 20 or 30 times during thi 30 day period. 4) Manipulation of the photoperiod made it possible to grow two generation within one year. This method, which is being used to speed up a breeding project, is briefl described. *Subject Headings:* **1. China aster (Callistephus chinensis) 2. Photoperiodism 3. Daylength effects on flowering.**—*Author's abstract.*

ENVIRONMENTAL INFLUENCES

See also: **Forest-climate relationships** (Rostlund), 11.5–58.

11.5–321 551.588.2:551.582(237.2)

*Dickson, R. R. (*U. S. W. B., Nashville, Tenn.*), **Some climate-altitude relationships in the southern Appalachian Mountain region.** *American Meteorological Society, Bulletin,* 40(7):352- 359, July **1959.** 11 figs., 2 tables (appendix), 8 refs. **DWB, DLC**—The variation of certair climatic elements with elevation is examined for Tennessee-North Carolina portions of the southern Appalachian region. Regression equations relating elevation to annual, January and July mean temperatures and mean daily temperature ranges and to length of growing season are derived. Early growing-season data for 15 mountain-valley systems in western North Carolina are examined and regression lines developed relating length of growing season to elevation for valley and summit locations. These regression lines adjusted for departure of early data from long-term averages appear applicable to recent long-term data and present a useful means of refining the growing season-elevation relationship. Although a satisfactory precipitation-elevation relationship is unattainable due presumably to slope and exposure effects, an estimate is given of the mean annual snowfall-elevation relationship. Graphs are presented showing the variation of potential evapotranspiration with elevation based on computations for selected locations from 1075 ft to 6684 ft; results are believed representative of the entire area under consideration. *Subject Headings:* **1. Climate-altitude relationships 2. Southern Appalachian Mountains, Tenn.-North Carolina.**—*Author's abstract.*

SYNOPTIC CLIMATOLOGY

See also: **Weather type-ice occurrence relationships** (Nusser), 11.5–211.

11.5–322 551.589:551.585

Giao, Antonio, **Basis of a dynamical classification of climates.** *Beiträge zur Physik der Atmosphäre,* Frankfurt a.M., 32(1/2):109–120, **1959.** 11 refs., 35 eqs. English, German and French summaries p. 109. **DWB, DLC**—The paper begins with a clear-cut definition of dynamic climatology as contrasted with stastical climatology. It is shown first that there is a set of functions which completely characterize the mean temporal, spatial and spatio-temporal behavior of the perturbations and consequently define the dynamic climate of any point without ambiguity. These characteristic functions are related by a system of identities which makes possible their determination by simply borrowing from the observations the number of pressure minima and the total variation during the basic time interval. As a consequence of these results, a scheme for the rational classification of dynamic climates is finally proposed. *Subject Headings:* **1. Dynamic climatology 2. Climatic classifications.**—*Author's abstract.*

MISCELLANEOUS

COSMIC INFLUENCES

See also: **Solar-terrestrial relationships** (de Jager), 11.5–88; **Solar spectroscopy** (Michard), 11.5–95; **Solar eclipses** (de Boer), 11.5–113; **Solar influences on geomag. field** (Srivastava, Sivasankara Sastri), 11.5–148.

11.5–323 551.590.21 523.746

*Visser, S. W. (*De Friedhoff 4, Ellecom, Holland*), **On the connections between the 11-year sunspot period and the periods of about 3 and 7 years in world weather.** *Geofisica Pura e*

Applicata, Milan, 43:302–318, May/Aug. 1959. 3 figs., 10 tables, refs. English summary p. 302. **DWB, DLC**—Five of BERLAGE's eight empirical rules concerning the Southern Oscillation (1957) may be united in one general rule with regard to the different influence of solar activity during 11-year sunspot cycles with annual maximum number R above or below 85. The opposite character of strong and weak 11-year cycles of solar activity is also present in the 27-year period. Finally, it is shown that a similar contrast obviously exists in the appearance of auroras. The results have not been statistically tested. Because of the rather small number of solar periods involved and the complicated character of the relations found, a satisfactory statistical method with which to operate could not be found. However, the 'converging evidence" enlarges considerably the statistical significance of the results. *Subject Headings:* **1. Sunspot cycles 2. Sunspot effects on weather.**—*Author's abstract.* Ⓢ

OPTICAL PHENOMENA

See also: **Solar eclipses** (de Boer), 11.5–113; **Twilight phenomena, Antarctica** (Weill), 11.5–131; **Elec. charges on haze** (Mühleisen), 11.5–330.

11.5–324 551.593.63:535(09)

Ho, Ping-Yü (*Univ. of Malaya*) and Needham, Joseph (*Univ. of Cambridge*), **Ancient Chinese observations of solar haloes and parhelia.** *Weather*, London, 14(4):124–134, April **1959.** 4 figs., 6 refs. **DWB, DLC**—Detailed observations of solar haloes and parhelia were made in China from the first century B.C. onward. By the 7th century the number of specific terms relating to halves exceeding anything in the west for at least 1000 years after (1630). Illustrations taken from unpublished manuscript texts in Cambridge University Library show complex halo drawings and accompanying text including technical terms (which are translated and annotated in this article). Explanations were of mystical course, and some of the phenomena were used as portents of weather and of nonmeteorological events. *Subject Headings:* **1. Halo observations, China 2. Optical phenomena 3. History of meteorological optics.** —*M.R.* Ⓢ

11.5–325 551.593.652:551.515.8(481)

*Hesstvedt, Eigil, **Mother of pearl clouds in Norway.** *Geofysiske Publikasjoner*, Oslo, 20(10), March 1959. 29 p. 12 figs., 10 tables, 17 refs. **DWB, DLC**—Examination of 168 mother of pearl cloud situations in Scandinavia in 1926–57 shows that mother-of-pearl clouds occur in the winter season, mainly in the period December–February. The clouds are generally located on the eastern side of the Norwegian mountains at 17–30 km (mean height 24 km). A close relationship is found between mother-of-pearl clouds and waves on the polar front. The space above the warm sector seems to be preferred, but the clouds also form relatively frequently ahead of the warm front and behind the cold front. Upper winds in the sector 260°–340° with only slight variation of direction with height seem to be necessary. In most cases the wind speed increases from the ground up to about 9 km (mean value 105 kts). Above 9 km a decrease is observed to about 50 kts at 15 km. The temperature in the stratosphere in mother-of-pearl cloud situations is found to be considerably lower than the average. Estimates of the dewpoints at various levels show that a temperature of $\div 90° - \div 100°C$ is probably necessary for cloud formation. Optical measurements of the droplet size gave diameters about 2–3μ. *Subject Headings:* **1. Nacreous clouds 2. Polar front waves 3. Norway.**—*Author's summary.* Ⓢ

11.5–326 551.593.7

Bullrich, Kurt, **Neue Messungen und Berechnungen der Himmelslichtpolarisation.** [New measurements and computations of sky light polarization.] *Germany. Deutscher Wetterdienst, Berichte*, 7(51):74–78, **1959.** 7 figs., 10 refs., 8 eqs. German and English summaries p. 74. **DWB, DLC**—Polarization of skylight is a physical quantity just as visibility, turbidity and scattering function which give information about aerosols structure in the atmosphere. In Mainz scattering function and polarization were measured at 7 spectral ranges (0.4–2μ) at different angles of the sun's vertical and at different altitudes of the sun. Furthermore, the polarization of skylight for different aerosols was evaluated. *Subject Heading:* **1. Sky light polarization.**—*Author's abstract.* Ⓢ

11.5–327 535.51:551.593

Kawski, A. (*Physikalisches Inst. der Technischen Hochschule, Gdánsk*), **Zur Messung de Polarisationsgrades mit Hilfe eines kompensierenden Glasplattensatzes III.** [Measuremer of the degree of polarization by means of a compensation glass-plates system, Pt. 3.] *Opti* Stuttgart, 16(7):412–418, July **1959.** fig., table, 7 refs., 33 eqs. **DLC**—The formulas fo two, three, and four glass-plates, which take into account internal reflection only, are generalize for a case of absorption of light in the plates, and the application of these formulas to th measurement of the degree of polarization of light waves in the photoelectric method of Tume man-Wille-Spektorow is discussed. *Subject Headings:* **1. Light absorption in plates 2. Pola ization of light waves.**—*Author's abstract.* Ⓢ

ELECTRICAL PHENOMENA

See also: **Charge and magnetic effects on satellites** (Beard, Johnson), 11.5 171; **Rocket measurement of trapped electrons** (Allen et al.), 11.5–178; **Radioactive ionization gages** (El-Moslimany, Spencer), 11.5–244; **Elec. charges on drops** (Magono, Takahashi), 11.5–305.

11.5–328 551.594.11(54(

Agarwala, K. S. (*Met. Office, New Delhi*), **Recent studies in atmospheric electricity in th India Meteorological Department.** *Indian Journal of Meteorology and Geophysics*, Delh 10(2):121–124, April **1959.** 19 refs. **DWB, DLC**—The work concerning the measurement o the electrical potential gradient at the surface and in the upper air is being carried on at Bom bay, Poona and Delhi in India. Author first discusses different studies relating to surfac electrical potential gradient, conductivity, mobility of small ions and air earth current. The mention is made of various studies regarding measurement of point discharge, etc. Finally recent attempts to observe electrical potential gradient and conductivity in the upper air ar reviewed. *Subject Headings:* **1. Atmospheric potential gradient measurements 2. India** —*I.S.*

11.5–329 551.594.12:551.594.2

Adkins, C. J. (*Cavendish Lab., Cambridge*), **The small-ion concentration and space charge near the ground.** *Royal Meteorological Society, Quarterly Journal*, 85(365):237–252, July **1959** 10 figs., 19 refs., 3 eqs. **DWB, DLC**—A series of detailed measurements was made of the concentration of small ions near the ground. It was found that for values of the atmospheric potential gradient exceeding some ± 500 v m^{-1} the electrode effect in the small ions was readily observable, and that when rain fell in a large electric field, there took place a large production of ions of sign opposite to that of the field. The latter effect was examined in some laboratory experiments which showed that the release of charge in the form of ions was associated with splashing. The mechanism by which the ions were produced was found and a determination made of the dependence of the charge released by individual drops on the field, drop mass and drop speed at impact. To determine the importance of the charge released by splashing at the ground, another series of observations was made including the measurement of space charge It was found that in fine weather the field was sometimes controlled by clouds of charge near the ground. In disturbed weather natural point discharge gave rise to considerable values of the space charge, and in comparison with these, the charges produced by the splashing of rain only became important during heavy rain. *Subject Headings:* **1. Ion production 2. Small ions near the ground.**—*Author's abstract.*

11.5–330 551.594.12:551.574.1:551.575:551.593.54

Mühleisen, Richard, **Elektrische Ladungen an Aerosol-, Dunst- und Nebelteilchen** [Electrical charges on aerosol, haze, and fog particles.] *Germany. Deutscher Wetterdienst Berichte*, 7(51):62–66, **1959.** 6 figs. German and English summaries p. 62. **DWB, DLC**— It has been proved by experiments in the laboratory and investigations in the free air tha negative ions with great mobility become free during the evaporation of water. This cause a generation of negative space charges (for instance in ground fog) and positive space charge on the surface and during the vanishing of the fog. The consequences of this generation o

electrical charges are discussed. *Subject Headings:* **1. Electrical charges on hydrometeors 2. Ion properties.**—*Author's abstract.*

11.5–331 551.594.13

Vogler, Gerhart (*Inst. für Geophysik. Erkundung der Univ. Leipzig*), **Über den Einfluss eines Emissionseffektes auf das Messergebnis der elektrischen Leitfähigkeit der Luft.** [The influence of an emission effect on the measurements of electrical conductivity of the air.] *Geofisica Pura e Applicata*, Milan, 43:250–254, May/Aug. **1959.** fig., 2 tables, 12 refs., 3 eqs. German and English summaries p. 250. **DWB, DLC**—An effect is described which is used to measure the electrical conductivity of gases with radioactive components. The measured values of the two polar conductivities are influenced in inverse proportion by the radiated quantum of charge arising from the decay of radioactive deposits at the measuring electrodes. The tendency of this influence depends on the measuring method applied. The discharging method indicates the too high negative conductivity and too low positive conductivity whereas the charging method leads to reverse results. The emission effect ϵ is a function of the radioactive substances contained in the gases, of the time of exposure and of the effective surface of the measuring condenser. The effect of ϵ is demonstrated by means of results of measured values of conductivity of the air. This effect may be eliminated by means of reducing the measured values with simultaneous polar basic values. *Subject Headings:* **1. Electrical conductivity measurements 2. Gas emission effects.**—*Author's abstract.*

11.5–332 551.594.253:551.578.1

Jolivet, J. (*Lab. de Physique du Globe, Saint-Claude, Guadeloupe*), **La charge électrique des gouttes de pluie dans les Antilles françaises.** [Electric charge of raindrops in the French Antilles.] *Annales de Géophysique*, Paris, 15(2):153–178, April/June **1959.** 9 figs., 5 tables, 7 refs., eqs. French and English summaries p. 153. **DLC**—Measurements have been made in Guadeloupe of the charges (with signs) of the individual drops during rainstorms, and of their diameters by indirect way. Statistics are given for the distribution of diameters and charges, for the intercorrelation between them, for the (number of positive drops/number of negative drops) ratio, with its fluctuations and their possible causes. Records of global charge during 105 sec. had been made previously in Martinique for the various kinds of rain observable there. Results are described. Causes for changing sign are investigated. For rainstorms, agreement is good with measurements in Guadeloupe, despite the differences between the two methods. *Subject Headings:* **1. Electrical charges on raindrops 2. Raindrop charge measurement techniques 3. Raindrop size distribution.**—*Author's abstract.*

AURORAS

See: **Auroras** (Isaev, Pushkov), 11.5–9; **Sec. D3,** p. 684; **Auroral temps.** (Armstrong), 11.5–132; **Auroral radiation belt particles** (Wentworth et al.), 11.5–152.

ACOUSTICAL PHENOMENA

See: **Acoustical propagation in sea water** (Ganson), 11.5–212; **Acoustical propagation in atmos.** (Dikiĭ), 11.5–268.

PART II. RECENT LITERATURE ON IONOSPHERIC RADIO PROPAGATION

Compiled by: Geza Thuronyi

INTRODUCTORY NOTE

This is the second in a series of compilations of material on the ionosphere. The materi published in the April issue contained items on physics of the ionosphere, this issue covers rad propagation phenomena, while the June issue will supplement these two. The some 500 item presented in these three compilations are merely an accumulation of material on the ionosphe and do not reflect any attempt at either completeness or selection. For any such purpose, previou issues of *Meteorological Abstracts* (including a bibliography on **Ionospheric propagation** in Vol. No. 4, April 1955) as well as other sources should be consulted.

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11E–1 551.510.535:621.396.8

Abel, W. G.; de Bettencourt, J. T.; Chisholm, J. H., and Roche, J. F. (*all, Lincoln Lab., M.I.T.*), **nvestigations of scattering and multipath properties of ionospheric propagation at radio frequencies xceeding the MUF.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1255–1268, Oct. 1955.

15 figs. (incl. photos), table, 12 foot-refs., bibliog. p. 1268. **DLC**—Some results are given of studi of ionospheric forward scatter propagation at frequencies exceeding normal muf in the high hf a low vhf range with the view of investigating potential point-to-point communications. Appro mately 13,000 hours of data were analyzed from measurements conducted since late 1951, on seve frequencies and paths, predominantly 1000 to 1100 miles in length, in mid-latitudes. Signal lev characteristics are presented in summary form and discussed. Most of the work was conducte at 49.6 mc on the 1066 mile Cedar Rapids, Ia. to Round Hill, Mass. path. Nominal 30 kw tra mitters and large rhombic transmitting antennas were employed. The median received sign levels were relatively weak, of the order of 100 db below free space values. Fading during sho periods in the absence of meteoric or sporadic E enhancements was found to be Rayleigh distribute For longer periods, of the order of an hour, the fading was essentially Gaussian, although meteo and sporadic E enhancements often changed the slope of the fading distribution curves at high signal levels. The normalized median levels were generally lower and the diurnal variations le marked than those reported by CRPL for the shorter Cedar Rapids to Sterling path (773 mile Seasonally, the median levels were higher in winter and summer and lower in spring and fall. The was an indication of lower levels with decreasing sunspot activity. The vertically-polarized co ponent of the received signal was some 6 db (median) lower than the horizontally polarized co ponent, when using the 2000-foot horizontal rhombic transmitting antenna. Studies in 1952 of o path signal levels and measurements of cosmic noise are described. The rms velocity of scattere averaged over a winter day was found to be 6 to 7 mc, using autocorrelation analysis. Effecti heights of scattering were found to be 84 to 94 km, for December, 1954, using two-way 49.6 mc pul transmissions over a short path (387 miles); daytime heights were lower than nighttime valu Recent one-way pulse transmission tests at the same frequency on a longer path (1066 miles) a described. Observations of ionospheric, meteoric, sporadic E, and tropospheric modes are discusse The received power, when using the same 2000-foot rhombic transmitting antenna on 49.6 and 27 mc, was found to vary inversely with the frequency most probably to the third or fourth power, t exponent decreasing with increasing 49.6 mc signal level. Additional measurements at 22.9 mc a described for the Alpine, N. J.-to-Goose Bay, Labrador path (1059 miles) conducted for about half-year in 1953. Observations at 21.6 mc are reported for signals received at Limestone, M from transmissions at Cincinnati (997 miles); signal level data and two-stage space diversity resu for the three-day period of observation in November, 1952 are described. *Subject Headings:* **1. Ion spheric radio wave propagation 2. Ionospheric scatter propagation 3. Radio wave scattering.** *Authors' abstract.*

11E–2 551.510.535:621.396.

Agy, Vaughn (*Natl. Bur. of Stands., Boulder, Colo.*), **Polar blackout occurrence patterns.** (I Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 2, Ionospheric Section.** N. Pergamon Press, issued 1958. p. 129–134. 4 figs.) **DWB.** Also issued in *Journal of Atmosphe and Terrestrial Physics*, London, Special Supplement, Pt. 2, 1957, pub. **1958.** p. 129–134. **DLC** On the basis of a Fourier analysis of times of polar blackouts, the author presents polar charts showi time of maximum probability of blackout occurrence on magnetically quiet and disturbed days, a a graph showing latitudinal variations of blackout probability. It is suggested that one type blackout is due to magnetic activity, while another type appears to be caused by some other ioniz agent, possibly X-rays of auroral origin. *Subject Headings:* **1. Polar blackout distribution 2. Auro ionization.**—*G.T.*

11E–3 551.510.535:621.396.6

†Agy, V. and Davies, Kenneth, **Ionospheric investigations using the sweep-frequency pu technique at oblique incidence.** *U. S. National Bureau of Standards, Journal of Research, Sec.* 63(2):151–174, Sept./Oct. **1959.** 26 figs., table, 24 refs. **DWB, DLC**—This paper describes t present state of oblique-incidence investigations of the ionosphere, using the sweep-frequency pu technique, with special reference to the work carried out at the National Bureau of Standar After a short review of the published literature, oblique-incidence sweeps are presented showing t diurnal and seasonal variations on two east-west paths of lengths 1150 kilometers and 2370 kilomet The discrepancies between observed and calculated maximum usable frequencies are presented both paths and then various phenomena of interest are shown. Finally, the above phenomena discussed in the light of existing knowledge and theory and, in particular, it is shown that the d crepancies between observed and calculated maximum usable frequencies are unlikely to be cau by magneto-ionic deviation of the ray. *Subject Headings:* **1. Sweep frequency measurement te nique 2. Ionospheric research.**—*Authors' abstract.* Ⓢ

11E–4 551.510.535:621.39

Aikin, A. C., **A tabulation of group height, phase height and nondeviating region absorpt at various low frequencies for a number of models of the lower ionosphere.** Pennsylvania. St

Univ. Ionosphere Research Laboratory. Contract AF 19(604)-1304, Scientific Report, No. 101, March 1, 1958. 88 p. 4 figs., 5 tables, 9 refs., 9 eqs. numerous graphs. **DWB** (M10.535 P415i)—Methods for obtaining group height, phase height and nondeviative absorption are outlined. These methods are then applied to fifty reasonable electron density profiles. Tables of the resulting group and phase heights and nondeviative absorption are given for frequencies of 75 kc/sec, 150 kc/sec, 400 kc/sec and 500 kc/sec. The application of the models to sunrise effects is discussed. *Subject Headings:* **1. Ionospheric models 2. Sunrise effects on ionosphere.**—*Author's abstract.*

11E–5 551.510.535:621.396.1

†Albrecht, Hans J., **Investigations on great-circle propagation between eastern Australia and Western Europe.** *Geofisica Pura e Applicata*, Rome, 38:169–180, **1957.** 2 figs., 2 tables, 25 refs. English and German summaries. **DLC**—From propagation data in the frequency range 3–30 Mc/s collected during the period 1952 to February 1957, the author selected the results representative of conditions prevailing during the sunspot minimum, November 1953 to December 1954. Emphasis being laid on studies concerning propagation near the LUHF, monthly median values of path attenuation, path characteristics, and times of openings are given where the measurements were sufficiently conclusive. All results are discussed with reference to ionospheric predictions. *Subject Heading:* **1. Ionospheric radio wave propagation.**—*Author's abstract.*

11E–6 551.510.535(02)

†Al'pert, Ia. L., **Rasprostranenie radiovoln v ionosfere.** [Propagation of radiowaves in the ionosphere.] Moscow, Gosud. Izdatel'stvo Tekhniko-Teoreticheskoĭ Literatury, **1947.** 276 p. 122 figs., tables, over 500 refs., eqs. **DLC** (QC661.A43)—An early, though thorough, textbook, summarizing systematically the theoretical and empirical knowledge on many aspects of ionospheric radio propagation: theory of propagation in inhomogeneous media, distribution of radiowaves in ionized gases, experimental techniques of ionospheric research and results of investigations, experimental data in the ionosphere (layers, height distribution of ionization, daily and seasonal regime, cycles, solar relations, recombination coefficient, absorption, sporadic E (Es), ionospheric storms, forecasts, etc.). Charts and useful tables are reproduced and a bibliography of world literature arranged by 18 major subject categories appended. Such aspects as the influence of the moon, eclipse or auroral effects, delayed echos, fading, polarization, etc. are brought out in the bibliography. *Subject Headings:* **1. Ionospheric radio wave propagation textbooks 2. Ionospheric radio wave propagation bibliographies.**—*M.R.*

11E–7 551.510.535:551.510.62:551.507.362.2

*Al'pert, Ia. L.; Chudesenko, E. F. and Shapiro, B. S., **Rezul'taty issledovaniia vneshneĭ oblasti ionosfery po nabliudeniiam za radiosignalami pervogo iskusstvennogo sputnika Zemli.** [Results of studies conducted in the outer regions of the ionosphere by observations of radiosignals of the first artificial earth satellite.] *Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu MGG, Predvaritel'nye itogi nauchnykh issledovaniĭ . . . sputnikov zemli i raket*, No. 1:40–108, **1958.** 18 figs., 26 tables, 15 refs., 28 eqs. English summary p. 51. **DWB**—The method of research on the upper atmosphere by means of artificial earth satellites described in this paper is based upon the determination of the time of "radioset" and "radiorise" of the satellite. The distribution of the concentration of electrons in the outer ionosphere provides information about the properties of interplanetary gases. The trajectories of radio waves in the ionosphere and methods of investigating them are described in detail. Results of the theoretical calculations of the maximum horizontal distance of the receipt of radio signals are given. The calculations were made for a spherical earth and the tabulation of the resulting elliptical integrals was carried out with a high speed electronic computer. The calculations used the parabolic model of the lower ionosphere and the exponential decrease of the electron concentration in its outer part. In the analysis of the experimental data, the parameters of the lower ionosphere and the altitude of the artificial satellite were used and the maximum distances of signal reception were determined on the basis of ballistic data and other studies of the trajectories of the satellite. The electron concentration of the ionosphere N was found to decrease much slower after its maximum N_m than it increased to the maximum N_m. For the model $N_z \sim N_m - e^{-xz}$ the value $X \simeq 3.5 \cdot 10^{-3}$ l/km is obtained. This means that the number of electrons in the outer part of the ionosphere is approximately 3.6 more than in the lower part. Extrapolation of the observational data received for the altitudes $z \sim 300 \div 650 - 700$ km to $z \simeq 3000$ shows that with $z \sim 2000 - 3000$ km, $N \simeq 200 - 300$ el/cm^3. A curve of the density of neutral particles $n(z)$ according to the life time of the electron and the time between different acts of ionization is drawn. It is concluded that the altitude of the "limits" of the atmosphere (region of contact with interplanetary space) is of the order of 2000–3000 km. Appendices contain the following: calculation of the maximum distance of distribution of waves in the approximation of geometrical optics and tables of maximum horizontal distance r_m (in km) for a series of given parameters. *Subject Headings:*

1. Satellite ionospheric observation 2. Ionospheric radio wave reflection 3. Ionospheric electro density distribution.—*Authors' abstract and I.L.D.*

11E–8 551.510.535:621.396(

[American Radio Relay League], **Study of transequatorial scatter propagation.** Contract A 19(604)-2171, Final Report, **1959.** 25 p. At head of title: IGY Project 6.22.—To collect an utilize observations by amateur radio operators in the very high frequency range, the ARRL-IG Propagation Research Project was organized. The present paper is a systematic report of how th project was carried out. It discusses in separate chapters the actual nature of the project, settir up of the observing group, data processing, data codes and, finally, the results. It is reported tha 593 amateurs, out of 1320 on the project mailing list, actually submitted the semimonthly log requested. Bands available to them are one or more of the following (depending on location) 50 54, 70–72, 144–148, 220–225 and 420–450 Mc. The data received was duly processed. Th project's results consist of 281,640 punched cards with the following (chiefly 50 Mc) propagatio modes, auroral reflection, F2-layer back scatter, sporadic E single and double hop, meteor/ionospher forward scatter and transequatorial scatter. Upon analysis it is found that transequatorial scatte is not limited to the Americas but occurs in many parts of the world, all paths being roughly sym metrical to the geomagnetic equator. *Subject Headings:* **1. Ionospheric scatter propagatio 2. Transequatorial radio wave propagation. I. IGY Propagation Research Project.**—*I.S.* Ⓢ

11E–9 551.510.535:551.510.62:621.396.1

Ames, L. A.; Martin, E. J. and Rogers, T. F. (*all, A.F. Camb. Res. Center, Bedford, Mass.*) **Some characteristics of persistent VHF radiowave field strengths far beyond the radio horizon** *Institute of Radio Engineers, N. Y., Proceedings,* 47(5, Pt. 1):769–777, May **1959.** 13 figs., 32 refs **DWB**—The most recent results of a continuing research program devoted to the study of long-dis tance VHF radiowave propagation are presented. Data obtained from measurements made at 5 and 220 mc on the surface and in the air are given which extend our previous results and clarif some important aspects of tropospheric and ionospheric propagation at extreme distances and heights *Subject Headings:* **1. VHF radio wave propagation 2. VHF field strength 3. Radio wave propagatio beyond the horizon.**—*Authors' abstract.* Ⓢ

11E–10 551.510.535:551.510.62:621.396.

Argence, Emile (*Neuershausen b. Freiburg*), **Kritische Betrachtung der Wellenausbreitung i einem isotropen absorbierenden Medium.** [Critical consideration of wave propagation in a isotropic, absorbent medium.] *Zeitschrift für Geophysik, Würzburg,* 21(1):1–9, **1955.** 11 refs. 19 eqs. German and English summaries, p. 1. **DLC** (QC801.Z4)—The influence of absorption o ionospheric short wave propagation is studied. We may handle the problem from two differen viewpoints: either with Epstein s method (1930), or with those of McCullagh, Cauch, Arzelies. Th latter have been developed for the treatment of reflexion from metals. In this first part result obtained for reflexion from metals are used. *Subject Headings:* **1. Ionospheric absorption 2. Iono spheric radio wave propagation.**—*Author's abstract.*

11E–11 551.510.535:621.396.

Argence, E.; Rawer, Karl and Suchy, Kurt, **Les théorèmes d'équivalence de l'absorptio ionosphérique.** [Equivalence theory of ionospheric absorption.] *Académie des Sciences, Paris Comptes Rendus,* 241(5):505–507, Aug. 1, 1955. 7 refs., 8 eqs. **DLC**—From the equation o propagation a general theory of equivalence is developed, from which Martyn's theory may b derived under certain conditions. The case of strong absorption is analyzed on the basis of th theory of diffusing media and reflection from metals. *Subject Heading:* **1. Ionospheric absorption.**— *Transl. of authors' abstract.*

11E–12 551.510.535:621.39

†Bailey, D. K.; Bateman, R. and Kirby, R. C., **Radio transmission at VHF by scattering an other processes in the lower ionosphere.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10) 1181–1231, Oct. **1955.** 69 figs., 5 tables, 38 foot-refs. **DLC**—The results of a program extendin over the last four and one-half years to investigate the nature and characteristics of high-loss regula VHF propagation by means of the lower ionosphere are presented. For the most part continuou wave transmissions are employed, with the result that the effects of the different elements in th propagation are superposed. Three different ionizing agents operating in the lower ionosphere can b distinguished by means of their differing effects on the behavior of the signal, after the exclusion o behavior associated with sporadic-E propagation. They are solar radiation, corpuscular radiatio presumably of solar origin, and meteors. The part played by each of these is discussed in the ac count and interpretation of the principal results obtained. Both short- and long-term characte istics of the observed composite signals are described, as well as the results of experiments wit

spaced and other antenna arrangements. The intensity and nature of the signals are discussed as a function of time of day, season, geographical position of the transmission path, and level of solar activity. The dependence of the strength of the signals on path length, on frequency, and on scattering angle has been studied. In the latter connection, pulse experiments were performed with equipment permitting fairly direct height determinations, which are found to be in satisfactory agreement with earlier less direct height determinations. Attempts to compare the observations with various existing theories designed to account for the propagation as a scattering process have been made. The results are not entirely satisfactory. The role of antennas in determining the behavior of received signals is examined from the point of view of geometrical concepts of scattering beamwidth, effective scattering volume, and signal coherence. Results of measurements of the realized gain of directive antenna systems are interpreted in relation to parameters involved in the scattering geometry, the influence of meteoric ionization, and the existence of large scale inhomogeneities in the ionosphere. A discussion is given of the possibilities for application of this type of propagation to communication systems operating over distances from about 1000 to 2300 k. Design considerations for antenna systems including siting, choice of polarization, and space diversity are given. The useful range of frequencies and certain modulation techniques are discussed. Attention is given to multipath effects associated with the scattering process, and with the presence of meteoric and auroral ionization. Reliability of performance of typical systems is estimated. *Subject Headings:* **1. Radio transmission 2. Ionospheric radio wave propagation 3. Radio wave scattering.**—*Authors' abstract.*

11E–13 621.396.8:551.510.535

Bain, W. C. and Shearman, E. D. R., **Observations on the U.S.S.R. earth satellites and the study of radio-wave propagation.** *Institution of Electrical Engineers, Proceedings, Pt. B,* 106(27):259–263, May **1959.** 5 figs., table, 8 refs., 3 eqs. **DLC**—Measurement of bearing, angle of elevation and Doppler frequency shift have been performed at Slough on transmissions from the Russian earth satellites. The examples considered here indicate that the observed phenomena can be accounted for satisfactorily in terms of our present knowledge of ionospheric propagation. A short section is included on orbital determination from the measurements. *Subject Headings:* **1. Radio wave propagation 2. Doppler frequency shift 3. Ionospheric radio wave propagation 4. Satellite observations.**—*Author's abstract.* Ⓢ

11E–14 551.510.535:551.507.362.1

Baker, Kay D. (*comp.*), **High-altitude rocket loop antennas.** Utah. Univ. Upper Air Research Labs., Contract AF 19(604)-2227, Scientific Report, No. 3, Aug. 21, **1957.** 88 p. 16 figs., 6 tables, foot-refs., 43 eqs. **DWB** (621.38 U89hi)—Discussion and illustration of construction and field tests on an antenna specifications, impedance, field intensity, radiation resistance and radiation efficiency of an antenna for use in ionospheric soundings by means of an Aerobee High Altitude sounding rocket. This specially designed antenna is of the delta-loop type, made of copper covered steel wire (copperweld), whose radiation efficiency is greater than that of twisted steel cable and whose strength is greater than copper wire. *Subject Headings:* **1. Rocket antennas 2. Ionospheric sounding by rockets.**—*M.R.*

11E–15 551.510.535:621.296.8

Banerji, R. B. (*Ionosphere Res. Lab., Penn. State Univ.*), **Heights of irregularities giving rise to the fading of 150-kc waves.** *Journal of Geophysical Research,* Wash., D. C., 60(4):431–439, Dec. **1955.** 4 figs., 3 eqs., 18 refs. **DLC**—Evidences are quoted which show that the fading of 150-kc waves is due to random absorption rather than random scattering from the ionosphere. On the basis of this, a statistical theory has been worked out for the relationship between phase and amplitude of a wave which has encountered random absorption on its downward passage. The predicted behavior shows excellent agreement with experiment and yields a method for the estimation of the collisional frequency at the region where the absorption is taking place. Experimental results pertaining to 150-kc waves at State College are described and discussed. The method has possibilities for supplementing wind-measurement results to provide information regarding the heights of winds. *Subject Headings:* **1. Ionospheric absorption 2. Collisional frequencies 3. Radio fading.** —*Author's abstract.*

11E–16 551.510.535:621.396.1:550.38

Barber, N. F. and Crombie, D. D. (*both, Dept. Scientific & Indust. Res., Lower Hutt, New Zealand*), **V.L.F. reflections from the ionosphere in the presence of a transverse magnetic field.** *Journal of Atmospheric and Terrestrial Physics,* N. Y., 16(1/2):37–45, Oct. **1959.** 4 figs., 14 refs., 20 eqs. **DWB, DLC**—The reflection coefficient is found for waves that are incident on a sharply bounded ionosphere and have their electric vector in the plane of incidence. The earth's magnetic field is assumed to be horizontal and perpendicular to the direction of propagation. Hence, the

analysis is appropriate for propagation round the magnetic equator. It is found that the reflect coefficient for waves incident from the west is numerically greater than that for waves incident fr the east, when the angle of incidence is large. *Subject Headings:* **1. Ionospheric VLF propagati 2. Ionospheric radio wave reflection coefficients 3. Magnetic effects on radio propagation.**—*Autho abstract.* Ⓢ

11E–17 551.510.535:621.39

Bateman, R. (*Page Communications, Eng. Inc., Wash., D. C.*); Finney, J. W.; Smith, E. et al. (*all, Natl. Bur. of Standards, Boulder, Colo.*), **IGY observations of F-layer scatter in the E East.** *Journal of Geophysical Research*, Wash., D. C., 64(4):403 405, April **1959.** 2 figs., tabl 2 refs. **DLC**—Peculiar signal enhancements observed during transmissions at 36 to 50 Mc/s betwe the Philippines and Okinawa appear to represent F layer scatter. These signals are observed nigh for periods of several hours during the months of September and October. Pulse tests indicate layer heights for these signals. Considerable pulse broadening is observed and the signals genera arrive from somewhat off the great circle path. *Subject Headings:* **1. F layer scattering 2. Far E I. Tveten, L. H. II. Watts, J. M.**—*Authors' abstract.* Ⓢ

11E–18 551.510.535:621.396.8:523.1

Bhonsle, R. V. and Ramanathan, K. R. (*both, Physical Res. Lab., Ahmedabad*), **Studies of cosm radio noise on 25 Mc/s. at Ahmedabad.** *Journal of Scientific and Industrial Research, Sec. A*, N Delhi, 17(12), Special Supplement, Dec. **1958.** p. 40–45. 5 figs., 4 tables, 6 refs. **DWB, DLC** The results discussed were obtained from March 1957 to Feb. 1958. The method of analysis was check the cosmic noise intensity at a local hour, finding the corresponding sidereal time, obtaini extra terrestrial intensity from the (25 Mc/s) curve and then calculating the absorption. T separate contributions of the D and the F2-layers are discussed in relation to the total attenuati It was found that D absorption can be <foF2. Ionospheric irregularities alone are not responsi for the excess attenuation observed in early night hours. *Subject Headings:* **1. Cosmic radio noi 2. Ionospheric absorption 3. D layer 4. F2 layer 4. Ahmedabad, India.**—*W.N.*

11E–19 551.510.535:621.39

Bibl, K.; Paul, A. and Rawer, K., **Die Frequenzabhängigkeit der ionosphärischen Absorpti** [Frequency dependence of ionospheric absorption.] *Journal of Atmospheric and Terrestrial Physi* N. Y., 16(3/4):324–339, Nov. **1959.** 12 figs., table, 11 refs., 8 eqs. **DWB, DLC**—Detailed analy has shown that in most cases where observations did not follow the writers' old formula $L=B/(f+f$ $+N\cdot\Delta_3(\text{fo } E/f)$, intense echoes from a blanketing E layer were present. The theory is generaliz to the case of a thin, mirror-like Es layer embedded into a parabolic E layer (model *D*). This gi a new function depending on a second parameter given by the altitude of the mirror. By applicati of the new formula (with the actual parameters of each observation) we obtain a much better descr tion of the observed frequency variation. Noon values of *B* (non-deviative *D*-absorption) a *N* (deviative *E*-absorption) show opposed seasonal variations, *N* increasing but *B* decreasing w the sun's height. The variation of *N* can be explained satisfactorily by a small decrease of t altitude of the E layer with increasing height of the sun. *Subject Heading:* **1. Ionospheric absorpti** —*Authors' abstract.* Ⓢ

11E–20 551.510.535:621.39

Bickel, John E.; Heritage, J. L. and Weisbrod, S., **An experimental measurement of VLF fi strength as a function of distance, using an aircraft.** *U. S. Navy Electronics Laboratory, San Die Calif., Research and Development Report*, 767; NEL Report 767, Jan. 28, **1957.** 27 p. 29 fig 9 refs. **DWB** (M055 U585r)—Records and graphs show comparison of daytime and nighttime v low frequency (VLF) transmission conditions between ground transmitters near Seattle, Was San Diego, Washington, D. C., etc. in 1954, and an airplane operating at great distances from t station (to 7600 km). Variations in reception conditions as the plane flies away from or tow the transmitter are vividly depicted and their causes analyzed. Height of reflection of sky wav interference patterns, phase changes, etc. are interpreted in the light of theory. The record curves fall within the general range of the curves for ground wave and for 1, 2, 3, and 4 hop ionosphe reflection, but are far more irregular. Nomograms used in calculation of ionospheric-ground refl tion for 10°–2200 km. *Subject Headings:* **1. Aircraft VLF radio wave propagation observati 2. VLF radio wave propagation at great distances 3. Ionospheric radio wave propagation.**—*M.R*

11E–21 621.396.8:551.510.5

Bickel, John E. (*U. S. Navy Electronics Lab., San Diego, Calif.*), **Method for obtaining oblique-incidence reflection coefficients and its application to 135.6 kc/s data in the Alaskan ar** *Journal of Geophysical Research*, Wash., D. C., 62(3):373–381, Sept. **1957.** 7 figs., 3 tables, 2 re

LC—A method is presented for obtaining the amplitude of an obliquely reflected one-hop sky-wave om recordings of a continuous transmission of a low-frequency radio signal. The reflection coeffi- ent is obtained from the ratio of the one-hop sky-wave to the calculated unabsorbed one-hop y-wave. The method is applied to a 135.6-kc/s signal recorded in the Alaskan area. The "R" omponent of the reflection coefficient is obtained. *Subject Headings:* **1. Radio wave reflection Reflection coefficients 3. Alaska.**—*Authors' abstract.*

11E–22 551.510.535:551.594.12:551.507.362.2:621.396.8

Blackband, W. T.; Burgess, B.; Jones, I. L. and Lawson, G. J. (*all, Radio Dept. Royal Aircraft stab., Farnborough, Hants*), **Deduction of ionospheric electron content from the Faraday fading f signals from artificial earth satellites.** *Nature*, London, 183(4669):1172–1174, April 25, **1959.** figs., table, ref. **DWB**—There are two classes of fadings involved: (1) those due to change in nergy flux at the receiving aerial and (2) those accompanying a rotation of the plane of polarization f this energy. The results of a method used to interpret the fading records of Sputnik 1 and Sputnik taken at Farnborough and Cambridge show good agreement of the values of electron content hen compared with those deduced from ionograms taken at Slough and Inverness. The method f analysis discussed here is reliable. The results are shown in a table and two graphs. *Subject leadings:* **1. Ionospheric electron density computation 2. Satellite communication 3. Radio fading atterns.**—*W.N.* Ⓢ

11E–23 551.510.535:551.510.62:621.396.8

Blair, James C., **Frequency dependence of VHF ionospheric scattering.** *U. S. National Bureau f Standards, NBS Report* No. 6049, March 20, **1959.** 21 p. 35 figs., table. 9 refs. Also issued as s *Technical Note*, No. 9, April **1959.** 17 p. 35 figs., 11 refs. **DWB**—This report contains data btained by recording received signal intensities simultaneously at 5 frequencies over the 1295 km ath between the Long Branch transmitting station at Long Branch, Ill., and the receiving site at Boulder, Colo. (Table Mesa field station). The data presented here covers the period of Sept. 1, 1957 o June 30, 1958 (except for some later data on meteor burst and sudden ionospheric disturbances). Good simultaneous signal intensity records were obtained for most of this period on 30, 40, 50 and 4 Mc. The available transmitter at 108 Mc was not suitable for continuous reliable records prior o June 5, 1958. In addition to the routine, 24-hr-a-day recording of average received power, a set f high-speed records was made for 10-min. intervals at different times during one day and analyzed or amplitude-distribution and fading-rate. Also, a low-sensitivity recording was made for the tudy of meteor bursts. Data presented here show the measured results of frequency dependence of verage received power and illustrate how the level of average received power is influenced by neteoric ionization, sporadic-E ionization, and ionospheric and magnetic disturbances. A summary f hourly median and upper and lower decile values on all frequencies is included, as well as data on mplitude distributions and fading rates. *Subject Headings:* **1. VHF radio wave scattering 2. Iono- spheric radio wave scattering 3. Long Branch, Ill. 4. Boulder, Colo.**—*From author's introduction.* Ⓢ

11E–24 551.510.535:538.566.3:551.508.822

Boella, M., **A proposito delle esperienze di interazione ionosferica delle radiosonde.** [Experi- ments on ionospheric interaction of radiosondes.] *Il Nuovo Cimento*, Bologna, 12(1):140–142, July 1, **1954.** ref. **DWB**—Author criticizes Cutolo's conclusion that significant auto-interaction by the gyro-interaction mechanism had been demonstrated, on the grounds that the scatter of results was too great and that simple multipath interference effects may account for the relevant observa- ions. *Subject Headings:* **1. Ionospheric radiowave propagation. I. Cutolo, M.**—(*From Physics Abstracts, No. 9416, Oct. 1954.*)

11E–25 551.510.535:621.396.8

†Booker, Henry G. (*Electrical Eng., Cornell Univ., Ithaca, N. Y.*), **Phenomena of radio scattering n the ionosphere.** (In: American Academy of Arts and Sciences, **Atmospheric explorations.** Cam- bridge, M. I. T., **1958.** p. 101–125. 24 figs., 35 refs.) **DLC** (QC961.A4)—The nature of the onosphere and VHF radar reflection records is reviewed and illustrated and nine of the various scattering mechanisms and phenomena explained: 1) fading of quiet echoes; 2) "spread F" phe- nomenon; 3) aspect-sensitive echoes; 4) twinkling of point cosmic radio source noise; 5) long duration meteor trail echoes; 6) echoes from below the E region; 7) VHF scatter communication; 8) echoes from auroral ionization and 9) "sporadic E" phenomena. Many recorder records, graphs and histograms vividly illustrate the nature of these phenomena. The one factor which seems to be common to all of these anomalous conditions in the various ionized media is turbulence, so it is hoped that explanations may be forthcoming in terms of statistical turbulence theory. *Subject Headings:* **1. Ionospheric radiowave scattering (VHF) 2. Turbulence effects on ionospheric scatter- ing 3. Radar reflections from ionized layers.**—*M.R.*

11E–26 551.510.535:621.396:523.164.4

†Booker, H. G., **The use of radio stars to study irregular refraction of radio waves in the ionosphere.** *Institute of Radio Engineers, N. Y., Proceedings*, 46(1):298–314, Jan. 1958. 19 figs., 41 refs., 42 eqs. **DLC**—Thirteen basic conclusions are reached after reviewing the observations and the theory of radio star scintillation. They cover the methods of observation, observational results, the frequency variation of amplitude scintillations, the diurnal and seasonal variations of amplitude scintillations, the variation of amplitude scintillations with zenith angle, scintillation rate and phase, the drift of irregularities, the size of irregularities and the means whereby they are correlated. *Subject Headings:* **1. Radio star scintillation 2. Ionospheric radio wave refraction**—*N.N.*

11E–27 551.510.535:621.396

Booker, Henry G., **Radio-scattering in the lower ionosphere.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2164–2177, Dec. 1959. 10 figs., 2 tables, 6 refs., 33 eqs. **DLC**—Radio scattering phenomena at the 80- to 90-km level observed in the frequency range 30 to 100 Mc/sec indicate the presence of irregularities of electron density with scales in the range from 20 to 60 meters (corrugation wavelengths from 120 to 360 meters). The irregularities are approximately isotropic and scattered power is inversely proportional to about the sixth power of scale. The power laws involved may, however, vary somewhat with the state of the atmosphere. The fading of the radio waves is consistent with random motions of the irregularities with velocities of the order of 25 m/sec. Similar observations of the sporadic-E phenomena occurring at a height of about 110 km show that the scattered power is inversely proportional to something like the eighteenth power of scale while the velocity of irregularities, if interpreted as random, is around 5 m/sec. *Subject Headings:* **1. Ionospheric radio wave scattering.**—*Author's abstract.* Ⓢ

11E–28 551.510.535:621.396.

†Bowhill, S. A., **The ionospheric irregularities causing fading of low-frequency radio waves.** Pennsylvania. State Univ. Ionosphere Research Lab., Scientific Report No. 89, Nov. 1, 1956. 138 p. 35 figs., 10 tables, 41 refs., 113 eqs. **DWB**—Report deals with the measurement with low-frequency radio waves of (1) fading speed, (2) fading speeds of signals reflected from E layer, (3) the structure of the random diffraction pattern at the ground, (4) the diffraction of a random signal, (5) the interpretation of long wave fading results by diffraction theory and (6) the problem of scattering. Models are presented and evaluated. Frequencies of 75 kc were used, but results on 16–200 kc presented for comparison. *Subject Headings:* **1. Ionospheric irregularities 2. D layer ionization 3. E layer ionization 4. Fading of long wave radio signals.**—*M.R.*

11E–29 551.510.535:621.396.

Bowhill, S. A., **The effect of the recorder time constant on the apparent speed of fading of a radio signal.** *Journal of Atmospheric and Terrestrial Physics*, 10(5/6):338–339, 1957. 2 figs., 3 refs., 4 eqs. **DWB**—The recorder time constant must be $<1/16$ of the mean fading period T_2 of the fading function, if the deduced fading speed is to be correct within 5%. *Subject Headings:* **1. Ionospheric research 2. Radio fading.**—*C.E.P.B.*

11E–30 551.510.535:551.510.62:621.396.

Bremmer, H. (*Philips Res. Lab. Eindhoven, Netherl.*), **Mode expansion in the low-frequency range for propagation through a curved stratified atmosphere.** *U. S. National Bureau of Standards Journal of Research, Sec. D*, 63(1):75–85, July/Aug. 1959. 6 refs., 40 eqs. **DLC, DWB**—This expansion is particularly useful when considering ionospheric propagation at low frequencies. The complex problem dealing with two media, viz., a homogeneous earth and a surrounding stratified atmosphere, leads to intractable expressions. However, as the influence of the earth may be accounted for by an approximate boundary condition at the earth's surface, the problem is then reduced to that of the outer medium only. The coefficients of the mode expansion for this simplified problem will be derived while taking into account the earth's curvature; however, the latter proves to be negligible under very general conditions. The expansion to be derived is wanted in particular when studying the influence of a gradual transition in the electron density with height at the lower edge of the ionosphere. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Stratified atmosphere.**—*Author's abstract.* Ⓢ

11E–31 551.510.535:621.396.

Budden, K. G. (*High Altitude Obs., Colo. Univ.*), **Effect of small irregularities on the constitutive relations for the ionosphere.** *U. S. National Bureau of Standards, NBS Report*, 5081, May 1, 1957. 32 p. 3 figs., 5 refs., numerous eqs. Also issued in its *Journal of Research, Sec. D*, 63(2):135–149, Sept./Oct. 1959. fig., 5 refs., 73+ eqs. **DWB**—Irregularities in the ionosphere which are small compared with one wave length may modify the constitutive relations, and hence, may affect the

fractive indices for electromagnetic waves. The modifications are in some ways similar to those hich would be introduced into the Appleton-Hartree formula by a Lorentz force. The theory is ven first for the case when the irregularities extend only in one dimension, and it is found that even a loss-free medium the refractive index now has an imaginary part which might be associated ith loss of energy from the wave by scattering. The theory for three dimensional irregularities is nen discussed, but is more difficult and a method of successive approximations is used. The results dicate that small irregularities may play an important part in the propagation of very low frequency dio waves in the ionosphere. In particular, they may explain why "whistlers" are observed only on comparatively rare occasions. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Refractive index 3. Whistlers.**—*Author's abstract.*

11E–32 621.396.8:551.510.535

Butler, S. R.; Gibbons, J. J.; Levy, G. S. and May, T. J., **Solutions of the coupled wave equations for vertical ionospheric propagation at 75 and 150 KC/S.** Pennsylvania. State Univ. Ionosphere Research Laboratory. Contract AF 19(604)-1304, Scientific Report, No. 84, **1956.** 131 p. gs., tables, 20 refs., eqs. **DWB**—In this report three computations are presented in which the roperties of radio waves reflected at vertical incidence from various ionospheric models are obtained. n two of these computations, one of which is for 75 kc/s and the other for 150 kc/s, the absorption nd polarization are computed. The polarization is obtained, by treating the coupling as a perurbation, by the method of variation of parameters. In the third computation coupling is not onsidered. In this problem attention is directed toward the mathematical justification of the ethods employed by Gibbons and Schrag. Finally, the results are compared with the currently vailable experimental data and conclusions are drawn concerning the electron density models mployed. *Subject Heading:* **1. Ionospheric radio wave reflection.**—*Authors' abstract.*

11E–33 551.510.535:621.396.8

Casselman, C. J.; Heritage, D. P. and Tibbals, M. L. (*all, U. S. Navy Electronics Lab., San Diego, Calif.*), **VLF propagation measurements for the Radux-Omega navigation system.** *Institute of Radio Engineers, N. Y., Proceedings,* 47(5, Pt. 1):829–839, May **1959.** 24 figs., 7 refs., eqs. **DWB**—This paper describes special VLF propagation measurements in connection with a feasibility tudy of a long range navigation system. Round-trip single-frequency measurement of phase tability was made between Hawaii and San Diego on frequencies from 10.2 kc to 18.2 kc in 1 kc ncrements. During January 15 to 23, 1958, the standard deviation of phase stability on 12.2 kc vas 4μ sec daytime and 5μ sec night time. One-way two-frequency transmissions were monitored n San Diego and Washington, D. C., to determine the phase stability of a 1 kc difference frequency or pairs of frequencies from 10.2 kc to 18.2 kc. Data analyzed at time of submission of this paper (10.2–16.2 kc) indicate limitations of the two-frequency system for lane identification (resolution of yclic ambiguities corresponding to one period of the carrier frequency). The techniques used to nstrument these tests are considered somewhat unique. Data reported herein are general and pplicable to any propagation study. The data being collected are leading to a better understanding of the mechanism of VLF propagation. *Subject Heading:* **1. Ionospheric VLF propagation measurements.**—*Authors' summary.* Ⓢ

11E–34 551.510.535:621.396.11

Chapman, J. H.; Davies, Kenneth and Littlewood, C. A., **Radio observations of the ionosphere at oblique incidence.** *Canadian Journal of Physics,* Ottawa, 33(12):713–722, Dec. **1955.** 12 figs., 4 refs. **DWB, DLC**—A description is given of an automatic method of using the radio pulse technique at oblique incidence to investigate the structure of the ionosphere. Sweep frequency photographic records were taken for the path Ottawa-Saskatoon (2355 km.). The records obtained confirm the validity of the theory relating vertical incidence to oblique incidence propagation. Sweeps showing such phenomena as E layer cutoff, transmission of the Pedersen ray, multiple reflections, are shown. It is found that the F1 layer is the important propagating layer rather than the F2 layer under certain conditions. Hence conventional methods of predicting frequencies over long distances require modification in these circumstances. *Subject Headings:* **1. Ionospheric structure 2. Radio pulse technique.**—*Authors' abstract.*

11E–35 523.164.83:621.396.8:551.510.535

Chvojková, Eliška and Link, F. (*both Astron. Inst., Ondřejov, Czechoslovakia*), **Echos lunaires sur 20 Mhz et structure de l'ionosphère.** [Lunar echoes at 20 MHz and the structure of the ionosphere.] *Bulletin of the Astronomical Institutes of Czechoslovakia,* Prague, 5(5):99–104, **1954.** 4 figs., 2 tables, 5 refs., 16 eqs. Russian summary p. 104. **DLC**—A simple theory is proposed for the penetration of waves coming from outer space. This theory is in better agreement with measurements made in Australia than BREMMER'S theory, as it accounts for attenuation by refraction. *Subject Headings:* **1. Radar echoes from moon 2. Ionospheric attenuation.**—*Transl. of authors' abstract.*

11E–36 523.164.4:551.510.535:551.510

Chvojková, E., **Propagation of radio waves from cosmical sources.** *Nature*, London, 181(460 105, Jan. 11, **1958.** 2 figs., 3 refs., 2 eqs. **DWB**—Examines the propagation of a radio wave from unionized medium (where its path is rectilinear) through a spherical ionized shell. The rectilin part of the ray path is rotated about the center of curvature of the ionized layer by the angle refraction $R = \frac{90°}{\pi}\left(\frac{f^c}{f}\right)^2 \frac{\sin i_0}{\cos^3 i_0}\,\sigma$, where i_0 = the angle of incidence of the rectilinear parts of the path; σ = equivalent thickness of the layer; f^c = critical frequency of the layer and f = wave frequen R depends only on i_0, f^c/f and the content of free electrons present in the layer; it is independent the electron distribution within the layer. *Subject Headings:* **1. Ionospheric radio wave refract 2. Cosmic radio frequency radiation refraction.**—*N.N.*

11E–37 551.507.362.2:551.510.535:621.39

Chvojková, E. (Woyk, E.), **The antipodal reception of Sputnik III.** *Institute of Radio Enginee N. Y., Proceedings*, 47(6):1144, June **1959.** fig., 4 refs. **DWB**—Antipodal reception of Sput signals at Stanford, Calif. on 20 Mc was reported by O. K. Garriott and O. G. Villard betw two afternoon passes, arriving from the SE. Conditions under which the signal propagates arou the world in either of two ionized layers (a) without reflection or escape, (b) with escape only, a (c) with return to earth, are discussed and illustrated and an explanation given of why the antipo point is the best for return to earth: at this point transmission can occur with equal probabil regardless of which great circle path is followed. Preferred direction of arrival depends on ionosphe conditions at points where ray first touches ionosphere and leaves it, respectively. Critical frequer of layer must increase from point where ray first enters ionosphere in order to prevent escape at n upward penetration of ionosphere. In mid latitudes levels containing the same electron dens must be more curved than the earth. No arrival can be expected from polar directions because rare polar ionosphere which would allow escape before mid latitudes were reached; or from the sou but SW in forenoon and SE in afternoon would be preferred. SW passage would be less freque than SE, since these SW rays would have to pass the region where the critical frequency falls to morning minimum. In the sunset (P.M.) region turbulence might produce multipath propagati but this would not destroy antipodal reception. Therefore, at Stanford frequent antipodal recepti in summer afternoons from SE would be expected. *Subject Headings:* **1. Satellite radio signa 2. Antipodal radio reception 3. Ionospheric radio wave propagation.**—*M.R.* Ⓢ

11E–38 551.510.535:621.39

Chvojková, E., **The refraction of radio waves by a spherical ionized layer.** *Journal of mospheric and Terrestrial Physics*, N. Y., 16(1/2):124–135, Oct. **1959.** 8 figs., 9 refs., 27 eqs. **DW DLC**—A general expression is derived for the refraction of radio waves passing completely through spherical ionized layer, using a simple ray treatment. A similar formula is derived for the ray-pa length. It is shown that when certain approximations appropriate to the terrestrial ionosphere made, neglecting absorption and the effect of the earth's magnetic field, the expression for refracti reduces to a simple form which has previously been derived by the author using a less general metho The perpetual propagation of radio waves along two levels in the ionosphere, the condition for whi appears in the derivation of the general formula, is briefly discussed. It is shown that with slig modifications the refraction formula is also valid for reflection, and an expression giving the distan of the point of reflection in the ionosphere from the transmitter on the earth's surface is derive *Subject Heading:* **1. Ionospheric radio wave refraction.**—*Author's abstract.* Ⓢ

11E–39 551.510.53

Crow, Edwin L. and Zacharisen, Donald H., **Pilot study of the preparation of world maps of critical frequencies and maximum usable frequency factors.** *U. S. National Bureau of Standard NBS Report* 5560, Feb. 28, **1958.** 68 p. 15 figs., 13 tables, 3 refs., 15 eqs. **DWB** (621.384 U585pi —The Central Radio Propagation Laboratory is undertaking the preparation of G.M.T. conto maps, possibly semipermanent, for predicting F2 layer maximum usable frequencies. Maps a to be given for each month of the year and each even hour of G.M.T. A degree of semipermanen is hoped for by presenting maps of foF2 and the 4000 km muf factor for twelve-month running avera Zurich sunspot number of 50, and also of the rates of change of these parameters with sunspot numb Thus radio propagation conditions can be predicted directly from these maps once the avera sunspot number is predicted. The pilot study reported herein examined the available data fro about ten ionospheric sounding stations in detail and drew 74 contour maps from data of all statio in order to evaluate the precision attainable with such maps and to choose between alternati methods of preparation. The total standard deviation of the error in predicting muf with the maps was found to be about 0.9 Mc at zero distance and about 3.1 Mc at 4000 km, increasing slight with sunspot number. A comparison of these maps, CRPL Series D, and Radio Research Stati Slough, maps with foF2 observations recorded in the F Series gave total standard deviations

edictions of, very roughly, 1.1, 1.1 and 1.6 Mc, respectively. *Subject Headings:* **1. F2 critical frequency maps 2. Ionospheric world maps.**—*Authors' abstract.*

11E–40 551.510.535:551.594.12:551.507.362.2:621.396.8

Daniels, Fred B. and Bauer, Siegfried J. (*both, U. S. Army Signal Res. and Dev. Lab., Ft. Monmouth, N. J.*), **Faraday fading of earth satellite signals.** *Nature*, London, 182(4635):599, Aug. 30, 1958. 2 refs., eq. **DWB**—Note on British attempts to estimate ionospheric integral electron content up to the satellite's height by means of rate of fading due to the Faraday effect. Too high values were obtained which may be explained by the omission of the satellite's radial velocity component in the theoretical expressions. *Subject Headings:* **1. Ionospheric electron density measurement techniques 2. Satellite ionospheric electron density.**—*W.N.*

11E–41 551.510.535:621.396.1

Davies, Kenneth. **Some studies of the transmission of high frequency radio waves via the ionosphere at oblique incidence.** Brown Univ. Div. of Engineering, Providence, Rhode Island, Contract AF 19(604)-2066, Scientific Report AF 2066/2, June **1958.** 34 p. 17 figs., table, 14 refs., 12 eqs.—The anomalous reflection of high frequency radio waves from the ionosphere at frequencies near the maximum observed frequency is described with graphical illustrations. The elementary theory of transmission via the ionosphere at oblique incidence and the analytical results of the investigation are discussed. This report also covers a description of the sweep frequency pulse measurements conducted in the United States and in Canada during 1952 through 1954. The data on how the anomalous propagation depends on the angle of incidence is obtainable from Canada where paths varying in length from about 1000 km to 6000 km are operated simultaneously. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Anomalous radio propagation 3. United States & Canada.**—*N.N.*

11E–42 551.510.535:621.396.82

Davis, R. M., Jr. and Finney, J. W. (*Central Radio Propagation Lab., NBS Boulder, Colo.*), **Interference effects of F2 propagation at VHF.** *U. S. National Bureau of Standards, NBS Report*, 7004, Oct. 15, **1958.** 18 p. 14 figs., 5 tables, 5 refs. **DWB** (621.384 U585 in)—F2 layer propagation is a major source of long-range interference connected with operation of ionospheric scatter communication circuits. The magnitude and variations of the interference are investigated in this report by means of a study of the maximum usable frequencies for 4000-km transmission (F2 4000 MUF). The variable selected for study is the frequency exceeded by the MUF for a given percentage of the total time over all the hours of the day. Values of this variable have been derived for each 10° of latitude in the E, I, and W zones, at three seasons of the year (December solstice, June solstice, and equinox) and for low and high sunspot numbers. The basic data used for the computation of F2 4000 MUF were the charts of this parameter predicted in the CRPL D-Series for 12-month periods representing low and high sunspot numbers. The data were reduced to the desired values of F2 4000 MUF exceeded 1% and 10% of the total time by a machine computation method. This consisted of the selection and testing of successive trial frequencies until values were found that corresponded to the 1.0% and 10.0% MUF's to the nearest tenth of a percent. The statistical considerations underlying the use of this method are discussed in some detail. An outline is given of the exploratory steps that led to the procedure finally adopted. Substantial revisions were made in the values of F2 4000 MUF originally derived on the basis of observations of this quantity at several positions on the earth's surface. The final data were incorporated in world charts applying to a given level (1% or 10%), a given season, and either low or high sunspot number. A procedure is described for using the charts to find the frequency required to limit scatter circuit interference to a specified level. Mention is made of the uncertainties and limitations inherent in any effort to predict the interference effects of F2-layer interference. The twelve world charts of F2 4000 MUF can be used to estimate both the mutual interference and the self-interference likely to affect a given scatter-communications circuit. *Subject Headings:* **1. Ionospheric propagation 2. Radio interference.**—*Authors' abstract.*

11E–43 551.510.535:621.396.1

Davis, R. M., Jr.; Smith, E. K. and Ellyett, C. D. (*all, Natl. Bureau of Standards, Boulder, Colo.*), **Sporadic E at VHF in the U. S. A.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(5, Pt. 1):762–769, May **1959.** 11 figs., 2 tables, 15 refs. **DWB**—An analysis is made of sporadic E propagation observed on the Cedar Rapids to Sterling path during the four years, 1952–1955. VHF transmissions over this path at frequencies of 27.775 mc and 49.8 mc provided the Es data. At this latitude, the summer months receive the preponderance of sporadic E. Diurnally, sporadic E occurrence tends to favor the daytime and evening hours with peaks of incidence about 1000 and 1800. No variation with sunspot number has been discerned. As a rule, higher Es signal intensities

are recorded at 28 than at 50 mc. Cumulative distributions of signal intensity are presented for two frequencies. A relationship is found between the frequency dependence of Es signal intensi ≧ −70 db, relative to inverse distance, and the distribution of fEs values at Washington, D. The relationship promises to be useful in the prediction of Es signal intensities on a world-wide ba An inverse correspondence is shown between sporadic E occurrence and geomagnetic activity. correspondence holds only over selected time intervals. The frequency dependence of recei power under sporadic E conditions is different from that during normal scatter. The med frequency exponent is two or more times as large for sporadic E, and the exponents cover a m wider range of values. This is tentatively explained by considering the Es region to be composed patches of intense nonuniform ionization, an hypothesis previously used to explain vertical-incide data. *Subject Headings:* **1. Sporadic E movements 2. VHF radio wave propagation.**—*Auth summary.* Ⓢ

11E–44 551.510.535:621.39

Denisov, N. G., **O vzaimodeĭstvii neobyknovennoĭ i obyknovennoĭ voln v ionosfere i effe umnozheniia otrazhennykh signalov.** [Interrelation between extraordinary and ordinary io spheric waves and the reinforcement of reflected signals.] *Zhurnal Eksperimental'noĭ i Teoretiches Fiziki*, Moscow, 29(3, i.e. 9):380–381, Sept. **1955.** 4 refs., 5 eqs. **DLC**—The ordinary and extraordinary ionospheric waves cannot be considered as independent since the media, while homogeneous, are not sharply bounded or separated. Only in the regions far from the bound layers can the two types be considered as separate or independent phenomena. Proof of the pendence in the boundary regions is given mathematically. This article transl. into English in corresponding issue of *Soviet Physics, JETP*, N. Y. *Subject Heading:* **1. Ionospheric radio wa propagation.**—*M.R.*

11E–45 523.74:551.510.535:621.39

Ellyett, C. D. and Leighton, H., **Solar cycle influence on the lower ionosphere and on V forward scatter.** *Institute of Radio Engineers, N. Y., Proceedings*, 46(10):1711–1716, Oct. **19** 4 figs., 2 tables. **DLC**—A brief survey of published literature indicates that the electron concent tion in the D region of the ionosphere changes with the solar cycle. Such changes should also apparent in the VHF forward scatter signal intensities. Analyses have therefore been made seven years' results, at 49.8 Mc from the Cedar Rapids, Iowa, to Sterling, Va., forward scatter pa (1243 km). On an annual basis, it is found that the monthly median received signal intensity, the noon and afternoon period only, follows the same trend as the mean monthly sunspot numb The effect is still more pronounced when comparison is made with magnetic disturbance index However, when the comparison with magnetic indexes is made using a direct comparison in each 3 period, and eliminating long-term trends, no observable increase of the signal intensity is found the magnetic conditions become disturbed. This is in sharp contrast to the behavior of such circu in auroral regions. Further analysis shows that a weak increase in signal intensity with a risi magnetic index does occur if the analysis is confined to the midday period. It is concluded, therefo that any magnetic influence is smaller on middle than on high latitude scatter circuits, but an eff can be clearly discerned by studying the magnitude of the received signal through a solar cyc These results show that VHF forward scatter signals are not caused by the reflection from met trails alone. *Subject Headings:* **1. Ionospheric scattering 2. Solar-ionospheric relationships** *Author's summary.*

11E–46 551.510.535:621.39

Fejer, J. A. and Vice, R. W. (*both, Nat. Inst. for Telecommunications, Res., Johannesburg, Africa*), **The use of full-wave solutions in the interpretation of ionospheric absorption measureme** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(3/4):307–317, Nov. **1959.** 5 figs., 15 re 13 eqs. **DWB, DLC**—A numerical method is developed for solving the equations of ionosphe wave propagation for vertical incidence. The method, which neglects coupling, is used for calculation of ionospheric absorption. The absorption is first calculated in the usual manner using the Appleton-Hartree formula and integrating up to the theoretical height of reflection. "full-wave" correction to this result is then obtained from a step-by-step integration of the w equation. The thickness of the region, for which this integration has to be carried out, is only a free space wavelengths, and therefore the additional time required for the calculation of the "f wave" correction is relatively short. Numerical examples show that for frequencies of about 2 M this correction cannot be neglected. The method is applied in a preliminary interpretation observed values of absorption. It is concluded that more than half of the observed absorption oc less than 2 km below the theoretical height of reflection. *Subject Heading:* **1. Ionospheric absorp calculation.**—*Authors' abstract.* Ⓢ

11E–47 551.510.535:621.396.1

Ferraro, A. J., **Experimental and theoretical investigations of the low frequency polarization of 60, 75 and 150 kc/s.** Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-4563, Scientific Report No. 121, July 31, **1959.** 96 p. 55 figs., 2 tables, 15 refs., eqs. **DWB** (M10.535 P415i)—The instrumentation for recording the state of polarization of 60 kc/s and 75 kc/s echoes for vertical incidence radio soundings is described in detail. Basically, the equipment resolves the polarization ellipse into its two circularly polarized components: the ordinary and extraordinary modes. The results of thirteen months of recording in the intervals of Dec. 1956 to April 1957 on 75 kc/s and Oct. 1957 to May 1958 on 60 kc/s are presented as monthly averages. In addition, a few typical daily curves of polarization for magnetically quiet and disturbed days are discussed. A catalogue of 25 ionospheric models for which the group height, phase height, absorption, and polarization have been computed for 60–75 kc/s and 150 kc/s are presented. From this catalogue a sequence of models is selected which adequately explains the "sunrise effect" as observed on 75 kc/s. In addition, a model is found which explains the average night-time data on 60–75 kc/s and 150 kc/s. *Subject Headings:* **1. Ionospheric polarization 2. "Sunrise effect" on ionosphere. 3. Pennsylvania. State Univ. Ionosphere Research Lab. II. Contract AF 19(604)-4563.**—*Author's abstract.* Ⓢ

11E–48 551.510.535:621.396.1

Ferraro, A. J. and Gibbons, J. J. (*Ionosphere Res. Lab., Pennsylvania State Univ., Pa.*), **Polarization computations by means of the multislab approximation.** *Journal of Atmospheric and Terrestrial Physics*, 16(1/2):136–144, Oct. **1959.** 6 figs., 2 tables, 7 refs., 4 eqs. **DWB, DLC**—Becker et al. (1951, 1958), discussed a step-discontinuity approximation method for rapidly determining the polarization of low frequency echoes including the effect of collisions and the earth's magnetic field. In the present paper, the results of this method are compared with those of a multislab approximation, and it is shown that the step method yields satisfactory results. For two electron density profiles (one near critical coupling and one far removed) the Rydbeck coupling region was subdivided into slabs of uniform media; by matching the fields between adjacent slabs, $N-1$ simultaneous equations (for N slabs) were obtained. Because of the complexity of these equations, digital computer techniques were employed to obtain the desired solutions. The rate of convergence was estimated by using an increasing number of slab approximations (as high as 10). *Subject Heading:* **1. Ionospheric polarization.**—*Authors' abstract.* Ⓢ

11E–49 551.501.4:621.396:551.510.535:535.51

Friedman, Gilbert H. (Pa. St. Coll. Ionos. Res. Lab.), **Addition of elliptically polarized waves including applications to the ionospheric propagation of low frequency radio waves.** Pennsylvania. State College. Ionosphere Research Laboratory, Contract AF 19(122)-44 (Basic Ionospheric Research), Technical Report, No. 29, Oct. 15, **1951.** 113 p. 39 figs., 2 tables, 19 refs., 47 eqs. **DWB**—For determination of the resultant polarization of two elliptical polarized waves, an instrument is developed that performs the computations automatically in a graphical way for interpretation of the observed data. Description of the polarization synthesized is given and its usefulness demonstrated by two studies. *Subject Headings:* **1. Radio wave polarization 2. Ionospheric radio wave propagation.**—*W.N.*

11E–50 551.510.535:621.396.1

Fulton, B.; Sandoz, O. and Warren, E. (*all, Defence Res. Telecommunications Estab., Ottawa, Canada*), **The lower frequency limits for F-layer radio propagation.** *Journal of Geophysical Research*, Wash., D. C., 65(1):177–183, Jan. **1960.** 12 figs., 4 refs., 13 eqs. **DWB, DLC**—The band of frequencies propagated via the ionosphere by the high-angle ray and that propagated by the low-angle ray are both limited at their low-frequency ends by reflections that occur at lower ionospheric heights. Methods are developed in this paper for the calculation of these limits. *Subject Heading:* **1. Ionospheric radio wave reflection.**—*Authors' abstract.* Ⓢ

11E–51 551.510.535:551.594.13

Gallet, Roger M. (*Nat. Bur. of Stands., Boulder, Colo.*), **The spectrum of the electron density fluctuations in the ionosphere.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 2, Ionospheric Section.** N. Y., Pergamon Press, **1958.** p. 165–170. fig., 4 refs., 18 eqs.) Also issued in *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement, Pt. 1, 1957, pub. **1958.** p. 165–170. **DWB, DLC**—A theory of atmospheric temperature and density fluctuations and of their effect upon ionospheric electron density is developed and the application of this theory to the scattering of radio waves is discussed. *Subject Heading:* **1. Ionospheric electron density computation.**—*G.T.*

11E–52 551.510.535:621.396

Gardner, F. F. (*Univ. Grounds, Chippendale, N. S. W.*), **The effect of sudden ionospher disturbances (S.I.D.'s) on 2.28 Mc/s pulse reflections from the lower ionosphere.** *Australia Journal of Physics*, Melbourne, 12(1):42–53, March **1959.** 7 figs., 2 plates, 10 refs. **DLC**—Th effects of sudden ionospheric disturbances (S.I.D.'s) on the complicated structure of ionospher echoes obtained with moderately high sensitivity at 2.28 Mc/s are described. The observatio indicate that flares of classes 2 and 3 can produce high values of electron density near the base of th ionosphere. Mean electron density can exceed 1000/cm³ over the height range 60–75 km, where th greatest relative increase in ionization occurs. Nevertheless, the greater part of the S.I.D. absorptio of waves reflected from the E region, or above, still occurs above 85 km. The times of maximu disturbance at the different ionospheric levels agree within the experimental limit of about 1 mi The times of subsequent recovery at levels up to 85 km also seem to be simultaneous. Howeve the recovery of the E echo lags behind that of the 85–90 km echo group, by about 4 min. on th average for large S.I.D.'s. It is quite likely that the delay is not wholly due to different recombin tion rates at different ionospheric levels, but is partly caused by a change in the quality of the i coming solar radiation during the life of the flare. *Subject Headings:* **1. Sudden ionospheric di turbances 2. Ionospheric radio wave reflection.**—*Author's abstract.* Ⓢ

11E–53 551.506.22:551.510.535:621.396:061

Gates, David M., **Preliminary results of the National Bureau of Standards radio and ionospher observations during the International Geophysical Year.** *U. S. National Bureau of Standard Journal of Research, Sec. D*, 63(1):1–14, July/Aug. **1959.** 11 figs., 2 tables, 18 refs. Also short version issued as **NBS radio, ionosphere, and airglow observations during IGY,** in *American Ge physical Union, Transactions*, 40(4):391–401, Dec. **1959.** 8 figs. **DLC, DWB**—A review is give of the activities of the National Bureau of Standards during the IGY. The equipment used each project is described and preliminary results of the observations are given. The following are of research are discussed: (1) World Warning Agency, (2) Ionospheric Vertical Sounding Station (3) VHF Propagation, (4) VHF Equatorial Forward Scatter, (5) Radio Noise Network, (6) Rad Satellite Observations, (7) Airglow Observations, and (8) World Data Center for Airglow an Ionosphere. *Subject Headings:* **1. Ionospheric radio wave propagation 2. IGY ionospheric progra 3. U. S. National Bureau of Standards.**—*Author's abstract.* Ⓢ

11E–54 551.510.535:551.594.

Gibbons, J. J. and Rao, B. R., **Calculation of group indices and group heights at low frequencie** *Journal of Atmospheric and Terrestrial Physics*, London, 11(3/4):151–162, **1957.** 5 figs., 2 tabl 8 refs., 38 eqs. Also issued as Pennsylvania State Univ. Ionosphere Research Laboratory, Contra AF 19(604)-1304, Scientific Report No. 92, April 1, **1957.** 35 p. 7 figs., 3 tables, 7 refs., 59 eq **DWB**—This report gives a method of obtaining a set of curves from which the group height to expected from a given electron density profile at a given frequency can be quickly determined. Su curves are presented for 75 kc/sec, 150 kc/sec, and 500 kc/sec. A formula is derived from which th group index u' is easily computed as a function of u and x. *Subject Heading:* **1. Electron densi profiles.**—*Authors' abstract.*

11E–55 551.510.535:621.396

Goodwin, G. L. (*Dept. of Physics, Adelaide Univ.*), **A discussion of ionospheric demodulati near gyro frequency.** *Australian Journal of Physics*, Melbourne, 12(2):157–163, June **1959.** 4 fig 15 refs., 3 eqs. **DLC**—Observations made in Adelaide of the ionospheric demodulation of rad waves near gyro frequency at vertical incidence are discussed. The effect occurs in the region about 90 km, and does not appear to decrease through dawn. An F layer reflected wave is demod lated by unequal amounts during its two passages through the region. The large magnitude of t effect and its lack of dependence on modulation frequency seem to be inconsistent with the theo of wave interaction. *Subject Headings:* **1. Ionospheric radio wave demodulation 2. F layer gyr frequency 3. Adelaide, Australia.**—*Author's abstract.* Ⓢ

11E–56 551.507.362.1:551.510.535:551.594.

Gringauz, K. L., **Raketnye izmereniia elektronnoĭ kontsentratsii v ionosfere pri pomosh ul'trakorotkovolnovogo dispersionnogo interferometra.** [Rocket measurements of the electr density in the ionosphere using ultrashortwave dispersion interferometers.] *Iskusstvennye Sputn Zemli*, Moscow, No. 1:62–66, **1958.** 4 figs., 8 refs., 4 eqs. **DLC.** Transl. into English issued **Artificial Earth Satellites,** issued N. Y., Plenum Press; London, Chapman and Hall, **1960.** Vol. 79–84. 4 figs., 8 refs., 4 eqs. The author presents the results of measurements of the verti distribution of electron concentration in the ionosphere from high altitude geophysical rock released in the U.S.S.R. during 1954–1958—one rocket attained a height of 472 km. T determination of electron concentration involved the use of a dispersion interferometer measure the dispersion of radio waves emitted by a rocket. The rocket, which was relea

a small angle to the vertical, was equipped with a transmitter emitting radio waves in the raviolet range with a frequency of f_1 and $f_2 = Pf_1$. The radio waves from the rocket were received two points on the earth and the phase differences and level of oscillations received were recorded ntinuously. The coordinates of the rocket were measured simultaneously by optical radio methods d the ionosphere was probed by means of a panoramic ionosphere station close to the point of ket release. The results of measurements which are presented concern frequencies of $f_1 = 48 \times 10^6$ and $f_2 = 144 \times 10^6$ $Hz (p = 3)$. The coefficient of refraction η_1 was computed by the equation

$$\eta_1 \approx 1 - \frac{Ne^2}{2\pi m f^2}$$

=effective concentration of electrons, e and m =charge and mass of electron, f =frequency in Hz.) e phase difference of the two receivers referred to the higher frequency is given by

$$\phi = \frac{2\pi p f_1}{c} \int_0^L (\eta p f - \eta f_2)\, dl.$$

ne variation of ϕ with variation of L from $L + \Delta L$, taking into account η_1 is given by

$$\Delta\phi = \frac{e^2}{mef_1}\left(\frac{P_2 - 1}{p}\right)\int_L^{L+\Delta L} N dl$$

d the mean value of N over ΔL is given by

$$N_{\text{mean}} = \frac{1}{\Delta L}\int_2^{L+\Delta L} N dl = \frac{cmf_1}{c^2}\,\frac{p}{P^2 - 1}\,\frac{\Delta\phi}{\Delta L}$$

ne rockets were released in middle latitudes. The results of the measurements relative to the gion lying below the maximum F ionization indicate that a clearly marked E layer does not exist. ne active height, at which radio waves of the ionospheric station in the F layer are reflected, lies –150 km lower than the active heights recorded by the ionospheric station. *Subject Headings:* **Ionospheric electron density measurement techniques 2. Rocket ionospheric measurements.** *I.L.D.*

11E–57 621.396.81:551.510.535

Hagfors, Tor (*Norwegian Defence Res. Establishment, Kjeller, Norway*), **Results of scatter easurements at 36 Mc/s over a 1200 km path.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 56, **Proceedings, Pt. 2, Ionospheric Section.** N. Y., Pergamon Press, **1958.** p. 205–209. 5 figs., refs., 3 eqs.) Also issued in *Journal of Atmospheric and Terrestrial Physics*, London, Special pplement, 1957, Pt. 2, pub. **1958.** p. 205–209. **DWB, DLC**—The experimental set-up of this ork consisted of a transmitter situated in the South of Norway and a receiver in the North, with a stance of 1130 km separating the two. The results of the experiment include the diurnal signal riation, the relation between field strength and ionospheric and magnetic data, the angular de- ndence of scattering cross section, frequency dependence of transmission loss and the signal fine ructure. *Subject Headings:* **1. Radio wave scattering 2. Ionospheric radio wave propagation.** *-N.N.*

11E–58 551.510.535:551.510.62:621.396.8

Hagfors, T., **Preliminary results of studies of the angular distribution of a VHF ionospheric rward scatter signal.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 12(4):340–341, **1958.** figs., 4 refs. **DLC**—This is a brief report on results obtained at 46.8 Mc/s over an 1150 km NS ath at the Norwegian Defence Research Establishment, Kjeller, Norway, Oct. 28, 1958. The periment described was made in order to determine the angular spectrum of the received waves by easuring the correlation over the wavefront. The graphical presentation of the recording yields aluable information on the background signal and on the angular spectrum. *Subject Headings:* **VHF radio wave scattering 2. Ionospheric radio wave scattering.**—*W.N.*

11E–59 551.507.362.2:551.510.535:621.396.1

Hame, T. G. and Kennaugh, E. M. (*both, Ohio State Univ.*), **Recordings of transmissions from he Satellite 1958Δ_2 at the Antenna Laboratory, Ohio State University.** *Institute of Radio Engineers, . Y., Proceedings*, 47(5, Pt. 1):991–992, May **1959.** fig., table, 2 refs. **DWB**—Observations of the adio transmissions from the Russian Satellite 1958Δ_2 (Sputnik III) were carried out at the Antenna aboratory Field Station, Ohio State University, Columbus. The signal characteristics of trans- issions from Sputnik I on 20.005 mc and that of Sputnik III are compared. During Nov. 1958 Jan. 1959, the period varied between 39 and 52 seconds. It was observed that a severe amplitude

fading, not due to Faraday rotation, had become superimposed on the transmission from Sputnik I. This is illustrated in two orthogonal polarization graphs. *Subject Heading:* **1. Satellite radio signa** —*N.N.* Ⓢ

11E–60 523.164.42:621.396.8:551.510.5

Hartz, T. R., **Radio star scintillations and the ionosphere.** *Canadian Journal of Physi* Ottawa, 33(8):476–482, Aug. **1955.** 5 figs., 6 refs. **DWB, DLC**—The observed intensity at t surface of the earth of radiation at a frequency of 50 Mc/s from a radio star has been studied. relationship is shown to exist between the fluctuations, or scintillations, in this observed radiati intensity and the angle of its incidence on the 400 km level of the earth's ionosphere. The occurrer of these scintillations is compared with other ionospheric phenomena as determined by verti soundings from the earth. The probable cause of the fluctuations has been localized to a source the high ionospheric regions. *Subject Headings:* **1. Radio stars 2. Ionosphere 3. Radio frequen radiation.**—*Author's abstract.*

11E–61 551.510.5

Haselgrove, J. (*Univ. Math. Lab., Cambridge*), **Oblique ray paths in the ionosphere.** *Physi Society of London, Proceedings, Pt. B,* 70(7):653–662, July 1, **1957.** 6 figs., 6 refs., eqs. **DLC, DW** —An electronic digital computer has been used to calculate ray paths in a parabolic ionosphe layer when the waves are incident in the plane of the magnetic meridian. This is a special applicati of a very general method. The results of the calculations are compared with what would be deduc from vertical soundings by the standard approximations of using Martyn's and Breit and Tuv theorems as if there were no field. *Subject Heading:* **1. Ionospheric reflection.**—*Author's abstract.*

11E–62 551.510.535:523.164.32:621.396.8:551.594.

Hatanaka, Takeo, **Faraday effect in the earth's ionosphere with special reference to polarizati measurements of solar radio emission.** Cornell Univ. School of Electrical Engineering, Contr AF 19(604)-73, Scientific Report, No. 5, Aug. 30, **1955.** 18 p. 5 figs., 8 refs., 34 eqs.—The auth and co-workers found that the polarized bursts from the sun were a mixture of a randomly polariz and an elliptically polarized component, with the ellipticity dependent on position of source in t sun's disk. The axis of the ellipse is rotated somewhat by the Faraday effect in the earth's ionosphe but unless total electron density along path of radio wave through ionosphere is known, the origi orientation of the axis cannot be obtained. The paper deals with the calculation of the Farad effect in the ionosphere. The general expression is given and then applied to the simple case wh the only effect is the rotation of the axis of the ellipse. *Subject Headings:* **1. Faraday effect in ion sphere 2. Solar radio wave polarization.**—*M.R.*

11E–63 551.510.535:523.7

Herrinck, Paul (*Bureau de Géophysique, Service Météorologique du Congo Belge et du Ruand Urundi*), **Analyse de la variation annuelle et semi-annuelle de la fréquence critique de la couche à Léopoldville-Binza.** [Analysis of the annual and semi-annual variation of the critical frequen of the F2 layer at Leopoldville-Binza.] (In: Angola. Serviço Meteorológico, **Miscelanea geofísi** Luanda, **1956.** p. 155–162. 4 figs., 2 tables.) **DWB** (M(08) A592mi)—The author shows th by considering each hour of the day, very good local ionospheric forecasts of foF2 can be made using an average value of foF2 derived from sunspot forecasts, and based solely on the fact that t amplitudes of annual and semi-annual variations are 1) the only important ones, and 2) independe of sunspot. An explanation is suggested for the main portion of these variations. *Subject Headin* **1. F2 layer critical frequencies 2. foF2 variations 3. Sunspots 4. Leopoldville-Binza, Belgi Congo.**—*G.T.*

11E–64 551.507.362.2:551.510.535:551.594.

Hibberd, F. H. and Thomas, J. A., **The determination of the electron distribution in the up ionosphere from satellite Doppler observations.** *Journal of Atmospheric and Terrestrial Physi* N. Y., 17(1/2):71–81, Dec. **1959.** 7 figs., 4 refs., 15 eqs. **DWB, DLC**—It is shown how the electr distribution in the upper regions of the ionosphere may be determined from simultaneous measu ments of the Doppler shifts of radio signals of two different frequencies received from an artifi satellite. The method is illustrated in detail by computations made on the 20 and 40 Mc/s sign from *Sputnik I. Subject Headings:* **1. Satellite radio signals 2. Ionospheric electron dens measurement technique.**—*Authors' abstract.* Ⓢ

11E–65 523.164.83:551.510.535:551.594.

Hill, R. A. and Dyce, R. B. (*both, Stanford Res. Inst., Menlo Pk., Calif.*), **Some observations ionospheric Faraday rotation on 106.1 Mc/s.** *Journal of Geophysical Research,* Wash., D. C., 65(

173–176, Jan. 1960. 6 figs., table, 4 refs., 4 eqs. **DWB, DLC**—The polarization twist imposed on 106.1 Mc/s radio waves by the ionosphere has been investigated by using the moon as a passive reflector, the purpose being to determine the total electron column density even at altitudes above the known ionosphere. Because the antenna is capable of being continuously directed at the moon for 12 consecutive hours, observations are possible from the pre-dawn ionization minimum to the moon-time maximum. A true-height profile computed from vertical-incidence ionosonde data of Sept. 16, 1957, suggests that the total electron content throughout the entire ionosphere is not a constant factor of the integrated electron content computed up to the level of maximum ionization density. *Subject Headings:* **1. Ionospheric polarization 2. Ionospheric electron density distribution.** —*Authors' abstract.* Ⓢ

11E–66 551.510.535:621.396.8

Hokkyo, Noboru (*Osaka City Univ. Dept. of Physics*), **The scattering of electromagnetic waves by plasma oscillations.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, Japan, 8(1):1–8, March 1956. 7 refs., 17 eqs. **DWB**—Theory of plasma oscillation is applied to the problem of the scattering of ~1000 Mc waves in the E layer of the ionosphere. It is assumed that a region of the ionosphere having an irregular or turbulent character contains "oscillating domains" or "coherent units" in which free electrons perform synchronous oscillations. These domains are shown to be effective in scattering waves of frequencies $\sim(c/v)\ wp$, where wp is the plasma frequency, v the mean thermal speed of electrons, and c the velocity of light. A rough estimate indicates that the scattered wave may be observable for a proper setup in the experiment, and that its angular dependence is $(\sin \frac{1}{2}\theta)^{-1}$, θ being the scattering angle. *Subject Headings:* **1. Electromagnetic wave scattering 2. Ionospheric scattering.**—*Author's abstract.*

11E–67 551.510.535:551.510.62:621.396.1

Horner, F., **La relation entre la propagation des ondes très longues et la direction.** [Relation between the propagation of very long waves and their direction.] *L'Onde Électrique*, Paris, 37(362): 535–538, May 1957. fig., 2 tables, 7 refs. **DLC**—Measurements made in England on 16 kc near vertical incidence show that about half the incident power is reflected from the ionosphere at night, the reflected signal being polarized elliptically toward the left. Results obtained in August over two short paths in different directions are in agreement with the hypothesis that the long axis of the ellipse of electrical polarization forms a 70° angle to the magnetic north, the eccentricity being 0.55. These results are similar to those published earlier for frequencies of the order of 100 kc. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Ionospheric polarization.**—*Trans. of author's abstract.*

11E–68 551.510.535:551.507.362.2

Ionospheric studies using earth satellites. *American Geophysical Union, Transactions*, 39(1): 169–174, Feb. 1958. fig., table. **DWB, DLC**—At the USNC-IGY meeting held on Nov. 5, 1957 at the Central Radio Propagation Laboratory (CRPL) of the Nat'l. Bur. of Standards, Boulder, Colorado, it was decided that a refinement of experimental techniques be undertaken. Representatives from 24 laboratories and organizations were present to give account of their observations of the Russian satellites. Ionospheric turbulence studies and the fluctuations and fading rates of ionospheric characteristics were collectively discussed. Recommendations adopted are contained in this report. *Subject Headings:* **1. Satellite ionospheric observation 2. Turbulence in the ionosphere.** —*N.N.*

11E–69 551.510.535:551.594.12

Isted, G. A., **Meteor activity as a factor in ionospheric scatter propagation.** *Marconi Review*, London, 21(131):161–172, 1958. 9 figs., 18 refs. **DLC**—The author suggests that weather-cloud discharges may be capable of producing bursts of ionization similar to those produced by meteors. Evidence has been found of groups of bursts having regular spacing between bursts; furthermore some of these groups are associated with thundercloud discharges in a manner which cannot be ignored. Interesting evidence has come to light which shows that the seasonal variation of relatively local lightning activity has clearly defined minima at each of the equinoxes despite the fact that the meteor theory would predict maximum ionization at the autumnal equinox. Meteor activity may be found to play a relatively small part in ionospheric forward scatter propagation and it is possible that the weather-cloud discharge of some other mechanism, as yet unidentified, may instead prove to be the dominant factor. *Subject Headings:* **1. Ionospheric scatter propagation 2. Meteor ionization 3. Thundercloud electrification.**—*From author's abstract.*

11E–70 551.510.535:621.396.1

Isted, G. A., **Round-the-world echoes.** *Marconi Review*, London, 21(131):173–183, 1958. 4 figs., 13 refs. **DLC** (TK5700.M3)—Observations made during an investigation into ionospheric

scatter propagation at a frequency of 37 Mc/s have shown that round-the-world echoes were pres
along a south-north route even when both the transmitting and receiving terminals were well ins
the daylight hemisphere. Under the conditions of the experiment, the signal seemed to have b
propagated through areas where, in the normally accepted sense, the F2 region could not have b
the supporting mechanism. Round-the-world echoes have also been observed from the sign
radiated at 20 Mc/s by Satellite 1957 Alpha. Analysis of the records revealed the existence of t
distinctly different beat notes, one from the square-wave signals themselves, the other occurr
during the intervals between them. The suggestion is put forward that transmission round
world is made possible by launching a radio wave against the ionosphere at an extremely sm
angle of incidence to produce a succession of reflections which are confined to the ionosphere its
Subject Headings: **1. Ionospheric radio wave reflection 2. Radio echoes 3. Radio wave round-t
world propagation.**—*From author's abstract.*

11E–71 551.510.535:551.507.362.1:621.39

Jackson, J. E. and Spaid, G. H., **Ground stations for NRL rocket studies of the ionosphe**
U. S. Naval Research Lab., NRL Report, No. 5342; *Upper Atmosphere Research Report* No.
Aug. 31, **1959.** 33 p. 18 figs. plus figs. in appendix, 11 refs., eqs. **DWB** (M11 U58u)—Betwe
1946 and 1958, a total of 23 rocket flights have been instrumented by NRL to measure electr
densities in the ionosphere and to investigate various related phenomena. The measurements w
based upon the transmission of cw signals from a rocket to receiving and recording stations on
ground. The nature of the experiments required phase comparisons between two harmonica
related frequencies. Since commercial receivers are unsuitable for this purpose, special receiv
equipment was designed by NRL scientists to meet the experimental requirements. Particu
considerations were given to bandwidth, noise, dynamic range, phase stability, signal-stren
metering, and input circuitry. The extremely narrow-bandwidth operation which is possible w
the cw method led to the design and use of a new type of crystal filter in the receiving system. T
need for separate reception of the ordinary and extraordinary modes of propagation led to a no
adaptation of the magic T at 7.75 Mc. A two-station system, first used at White Sands, N
Mexico, was later, during IGY, transferred to Ft. Churchill, Canada. A number of unusually stab
narrow-band rf sweep generators were developed to test, adjust, and calibrate the ground-stat
equipment. A greatly improved knowledge of the ionosphere at middle and Arctic latitudes
resulted from the data acquired at these ground stations. *Subject Headings:* **1. Rocket ionosphe
data 2. Ionospheric electron density measurement techniques 3. Radio sounding of ionosph
4. White Sands, N. M. 5. Fort Churchill, Canada.**—*Authors' abstract.* Ⓢ

11E–72 551.510.535:621.396

Jackson, J. E. and Kane, J. A., **Breakdown and detuning of transmitting antennas in
ionosphere.** *U. S. Naval Research Lab., NRL Report, No.* 5435; *Upper Atmosphere Research Rep*
No. 36, Aug. 24, **1959.** 23 p. 15 figs., table, 20 refs., 19 eqs. **DWB** (M11 U58u)—Impeda
measurements made on a 7.75 Mc rocket-borne antenna during several rocket flights indicate
altitudes above 110 km a capacitance change whose magnitude can be used to determine ambi
electron densities. In the 50 to 100 km region the antenna undergoes a radio frequency glow
charge resulting in a severe resistive loading and reduction of radiated power. The properties
this breakdown were investigated both theoretically and by laboratory experiments. The use of a
bias on the antenna was found helpful in preventing breakdown. The knowledge acquired from t
project is being applied to the development of improved rf probe techniques for the direct measu
ments of electron densities in the ionosphere. *Subject Headings:* **1. Rocket antennas 2. Anten
breakdown.**—*Authors' abstract.* Ⓢ

11E–73 551.507.362.1:551.510.535

Kane, J. A. (U. S. Naval Res. Lab., Wash., D. C.), **Arctic measurements of electron collis
frequencies in the D-Region of the ionosphere.** *Journal of Geophysical Research*, Wash., D.
64(2):133 139, Feb. **1959.** 4 figs., table, 12 refs., 14 eqs. **DLC**—Electron collision frequencies
the D region were measured with the aid of rockets launched during polar blackouts at Fort Churc
Canada (58°N.). During the blackouts the ionization content of the D region was large enough
cause a strong altitude-dependent absorption of a 7.75 Mc/s CW signal, radiated from the roc
The refractive indices and the difference absorption of the two magneto-ionic components of t
signal were simultaneously measured versus altitude. The electron collision frequency profile
then determined from these measurements. The results from two midday rocket flights, one m
in July, 1957, and the other in November, 1956, indicate that the electron collision frequencies in
Arctic D-region are lower by a factor of three than the standard values calculated by Nicolet (19
At 70 km the measured value of the collision frequency is $(1.0 \pm 0.3) \times 10^6$ sec^{-1}. *Subject Headi*
**1. Electron collision frequencies 2. Rocket ionospheric data 3. Arctic ionospheric measureme
4. Arctic.**—*Author's abstract.* Ⓢ

11E–74 551.510.535:551.594.13:621.396.8:551.507.362.2

Kazantsev, A. N. (*Academy of Sciences of the U.S.S.R.*), **Absorption and electron distribution in the F2 layer determined from measurements of transmitted radio signals from earth satellites.** *Planetary and Space Science*, N. Y., 1(2):130–135, April **1959.** 6 figs., 3 refs., 7 eqs. **DWB**—Comparison is made between measured field strengths of transmitted signals from earth satellites and those theoretically predicted when the transmitter position is in the region of maximum electron concentration of the F2 layer, below it, and above it. The observed absorption value agrees best for a biparabolic distribution with exponential continuation with $K = 8 \times 10^{-3}$ where the electron concentration is given by $N = N_{0e}^{-kh}$. The number of electrons per column in the upper region of the F2 layer is deduced to be 1.5×10^{13} electrons per cm^2. This value is compared to the findings of Burgess. Curves are given of field strengths at distances greater than 10,000 km. At distances of 16,000 km the formation of ionospheric wave guides makes possible the transmission of radio signals. *Subject Headings:* **1. Electron density in F2 region 2. Satellite ionospheric measurements.**—*Author's abstract.* Ⓢ

11E–75 551.507.362.2:551.510.535:621.396.8

Kent, G. S. (*Cavendish Lab., Cambridge*), **High frequency fading observed on the 40 Mc/s wave radiated from artificial satellite 1957α.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 6(1/2):10–20, Oct. **1959.** 8 figs., 9 refs., eq. **DWB, DLC**—A study has been made of high frequency fading observed on the 40 Mc/s wave radiated from the first Russian satellite (1957α). This fading had a frequency of a few cycles per second and it is concluded that it was produced by the passage of the waves through irregularities in the F region of the ionosphere. The size and spatial distribution of these irregularities have been examined, and it is found that they are about 1 km in size and that they occur at heights above about 250 km. They usually occur at latitudes greater than 50°N and are more concentrated towards the north. It is likely that their density is controlled by magnetic rather than geographic latitude and there is a tendency for them to be grouped into large areas. These have dimensions of several hundred kilometers and are elongated along the parallels of latitude. Comparison is made of the properties of these irregularities with those believed to be responsible for radio-stellar scintillation and spread-F echoes. *Subject Headings:* **1. Satellite radio signal 2. Ionospheric irregularities.**—*Author's abstract.* Ⓢ

11E–76 551.510.535:621.396.619

King, J. W. (*Cavendish Lab., Free School Lane, Cambridge*), **Ionospheric self-demodulation and self-distortion of radio waves.** *Journal of Atmospheric and Terrestrial Physics*, London, 14(1/2):41–49, April **1959.** 2 figs., 2 tables, 15 refs., 9 eqs. **DLC**—Experiments in which the phenomenon of ionospheric self-demodulation was investigated are described. Demodulation is observed to occur only at the lower modulation frequencies, and it is concluded that the occurrence of the phenomenon can be satisfactorily explained by an extension of Bailey's theory of ionospheric cross-modulation as presented by Huxley and Ratcliffe (1949). The magnitude of the observed demodulation effect agrees with the value predicted by theoretical considerations and is what would be expected in view of results obtained in cross-modulation experiments. Complications due to selective fading were not present in the experiments performed. It is found that self-demodulation decreases as does ordinary cross-modulation, near dawn; this is explained by the fact that the absorption of the radio wave occurs at a level where the collision frequency is of the same order of magnitude as the equivalent angular frequency of the wave. *Subject Heading:* **1. Ionospheric radio wave self-demodulation.**—*Author's abstract.* Ⓢ

11E–77 551.510.535:621.396.8

Kirby, Richard C. (*Natl. Bur. of Standards, Boulder, Colo.*), **Extreme useful range of VHF transmission by scattering from the lower ionosphere.** *Institute of Radio Engineers, N. Y., IRE Convention Record*, Pt. 1, **1958.** p. 112–120. 10 figs., 15 refs. **DLC** (TK6541.I5), **DWB**—Results are given from an experimental study of VHF propagation in the extreme distance range for scattering from the lower ionosphere. Signal intensity at 36.0 Mc/s was measured continuously for a year over the 1411 mile path from St. Johns, Newfoundland, to Terceira Island, The Azores, using high transmitting and receiving sites. The median transmission loss is approximately 13 decibels greater than for the same system operated over the 773 mile path Cedar Rapids, Iowa, to Sterling, Virginia; this ratio is interpreted in terms of the geometrical restriction of the effective scattering volume. Less pronounced diurnal and seasonal variation is related to occluding by earth curvature of scattering from heights below about 80 Km. Continuous "height gain" observations give evidence of variation of scattering height diurnally and seasonally. Results are given on the nature of the signal fading, space-correlation, realizable gain from arrays having extensive vertical aperture, and polarization effects. *Subject Headings:* **1. Ionospheric scattering layer height 2. VHF radio propagation.**—*Author's abstract.*

11E–78 551.510.535:621.396

Kirby, R. C., **1958 critique of VHF ionospheric scatter communication.** *U. S. National Bureau of Standards, NBS Report, 6020,* Nov. 10, **1958.** 8 p. 11 figs., 19 refs. **DWB** (621.384 U585ni)—Work at the National Bureau of Standards reported herein was carried out on behalf of the U. S. Air Force, Andrews Air Force Base, Washington, D. C. A review is given of principal research reported in 1957–58, as well as of several years of operational communication experience using VHF ionospheric scattering for point-to-point radio service. The developing defined role of ionospheric scattering in military and international communication is discussed, in relation to other techniques. A survey is given of antenna and modulation developments as well as contributions to basic knowledge of the propagation mechanism, including new information on geographical dependence. Frequency requirements are discussed in relation to type of service. *Subject Headings:* **1. Ionospheric scattering 2. VHF radio propagation.**—*Author's abstract.*

11E–79 621.396.1:551.510.53

Koch, J. W., **Study of phase stability for phase-keying applications in VHF ionospheric-scatter communications.** *U. S. National Bureau of Standards, NBS Report,* No. 6051, April 30, **1958.** 8 p. 7 figs., 2 refs. **DWB** (621.384 U585stud)—A study of phase stability of the ionospheric scatter propagation medium has been carried out, with the objective of determining the usefulness of phase-shift keying systems for communication by this mode. Observations of 20 millisecond integrated phase perturbations and instantaneous phase perturbations were made at frequencies of 30 and 50 megacycles per second. Results of the measurements program indicated that integrated phase variations over 20 millisecond periods were quite large for an appreciable percentage of the time, and that the ionospheric-scatter mode is not suitable for systems requiring phase stability for such periods. Data for the instantaneous phase variations were analyzed by determining the phase perturbations between 5 millisecond sampling points. These data were not of sufficient quantity to draw any definite conclusions, but did point up the need for more instantaneous phase measurements that can be resolved for sampling points separated by 2 milliseconds or less. The instantaneous phase perturbation data did tend to indicate that a system requiring phase stability for somewhat less than 5 milliseconds might be useful. *Subject Heading:* **1. Ionospheric scatter communication.**—*Author's abstract.* Ⓢ

11E–80 621.396.1:551.510.53

Koch, J. W., **Reduction of Doppler-shift errors in ionospheric-scatter FSK communication.** *U. S. National Bureau of Standards, NBS Report,* No. 6053, May 1, **1959.** 8 p. 5 figs., 7 refs. **DWB** (621.384 U585red)—Meteoric Doppler frequency shifts of signals propagated via ionospheric scattering cause errors in narrow-band FSK communications. A simple method of reducing the Doppler-shift errors has been tried. The principle of operation consists of locking out the main channel when a space signal is present. The experimental results show a useful reduction in error rate when the Doppler lock-out circuitry is used. *Subject Heading:* **1. Ionospheric scatter communication.**—*Author's abstract.* Ⓢ

11E–81 551.510.535:523.16

Komesaroff, M. M. and Shain, C. A., **Refraction of extra-terrestrial radio waves in the ionosphere.** *Nature,* London, 183(4675):1584–1585, June 6, **1959.** fig., 5 refs., 3 eqs. **DLC**—New expressions derived for refraction, taking into account the effects of horizontal gradients in electron density and considering the magnitude of the uncertainties involved in the necessary approximations are demonstrated. The analysis is restricted to the case of a transit radio telescope. The astronomical value of the ionospheric refraction corrections, the observed and corrected positions are indicated graphically. *Subject Headings:* **1. Ionospheric radio wave refraction 2. Cosmic radio wave refraction.**—*From authors' text.* Ⓢ

11E–82 523.164:551.510.53

Krishnamurthi, M.; Sivarama Sastry, G. and Seshagiri Rao, T. (*all, Physical Laboratories, Osmania Univ., Hyderabad*), **Abnormal ionospheric behaviour at 10 metres wavelength.** *Current Science,* Bangalore, 27(9):332–333, Sept. **1958.** fig., table, ref. **DLC**—The radiation intensity of 10 m cosmic radio waves fell to zero on Jan. 28, Feb. 21, and March 2, 1958 at the Physical Laboratories, Osmania University, Hyderabad, India (17°26′N, 78°27′E). The gradual fall of intensity occurred about sunrise time, and the rise of intensity toward end of the phenomenon was uniformly rapid in the three cases, but differed in duration of minimum noise level. Small scale irregularities in the upper ionospheric layers is offered as a plausible cause of this disturbance which is knowingly unrelated to any solar flare. *Subject Headings:* **1. Cosmic radio frequency radiation 2. Ionospheric anomalies 3. Sunrise effect on ionosphere.**—*W.N.*

11E–83 551.510.535:621.396.11

Landmark, B. (*Norwegian Defence Res. Establishment, Kjeller, Norway*), **Echoes from the lower ionosphere during Polar blackouts.** *Journal of Atmospheric and Terrestrial Physics*, London, (1):79–80, 1958. 2 figs. **DLC**—This is a short summary report on the special pulse soundings carried out near the mid-point of a path in the period 15 June to July 31, 1957 at Nordi (65°N, °E). The note presents some results obtained at this station. They may have some bearings in connection with conditions of radio fade-outs in the Polar region. *Subject Headings:* **1. Polar blackouts 2. Ionospheric echoes.**—*N.N.*

11E–84 551.510.535:621.396.1:523.164.42

†Lawrence, Robert S. (*Natl. Bureau of Standards, Boulder, Colo.*), **An investigation of the perturbations imposed upon radio waves penetrating the ionosphere.** *Institute of Radio Engineers, N. Y., Proceedings*, 46(1):315–320, Jan. 1958. 4 figs., 38 refs. **DLC**—A new method has been devised to measure continuously the phase deviations introduced by the ionosphere into the signals from discrete sources. Sample recordings of measurements at frequencies of 53, 108, and 470 Mc are given. An experiment combining this phase measuring technique and standard ionospheric soundings at the point of penetration of the line of sight is in progress and is expected to shed light upon the height of origin of ionospheric scintillations. *Subject Headings:* **1. Ionospheric radio scintillation 2. Scintillation of radio stars.**—*Author's abstract.*

11E–85 551.510.535:621.396.8:523.75

Leighton, Hope I. (*Nat. Bu. of Stand., Boulder, Colo.*), **Field-strength variations recorded on a VHF ionospheric scatter circuit during the solar event of Feb. 23, 1956.** *Journal of Geophysical Research*, Wash., D. C., 62(3):483–484, Sept. 1957. fig. **DLC**—Field strength anomalies of the SID type from 0300 to 1000 h Feb. 23, 1956 on 49.8 Mc (Cedar Rapids to Sterling) are shown graphically. Time coincided closely with flares seen at Tokyo and Kodaikanal and cosmic ray outbursts reported from all over the world. Rise in signal strength coincided with onset of flare, maximum anomaly with maximum intensity of cosmic ray enhancement, and return to normal signal strength with end of SID as reported from Okinawa and Japan, but continued after end of solar flare. *Subject Headings:* **1. VHF field strength anomalies 2. Solar flare effects on ionospheric propagation 3. Solar flare, Feb. 23, 1956 4. Cedar Rapids, Iowa-Sterling, Virginia path.**—*M.R.*

11E–86 551.510.535:621.396.11

Lejay, Pierre; Pillet, Geneviève and Chezlemas, René, **Mesure de l'absorption non déviative des ondes radioélectriques dans l'ionosphère.** [Measurement of non deviative absorption of radioelectric waves in the ionosphere.] *Académie des Sciences, Paris, Comptes Rendus*, 240(18):1745–1748, May 2, 1955. 3 figs., 2 refs. **DLC**—A method of ionospheric recording is described which eliminates errors affecting methods involving double echoes. Median values of absorption obtained at Domont (France) in Dec. 1954 and Jan. 1955 for every hour of the day are graphically presented. If the exponential law $(\cos \chi)^n$ is assumed for the variation of absorption (χ = zenith angle of the sun), 0.3 is obtained as the approximate value of n, which is close to the value found by Davies and Hagg (1955) for the same period at a higher latitude. *Subject Headings:* **1. Ionospheric absorption measurement.**—*G.T.*

11E–87 551.510.535:621.396.1

Lepechinsky, Dimitri, **L'influence sur les enregistrements de sondages ionosphériques de la couche E, du niveau de séparation des régions de propagation quasi longitudinale (Q.L.) et quasi transversale (Q.T.).** [Effect of the height of the boundary surface between regions of quasi-longitudinal and quasi-transversal propagation on records of ionospheric soundings for the E-layer.] *Académie des Sciences, Paris, Comptes Rendus*, 241(4):897–900, Oct. 3, 1955. 3 figs., ref., 3 eqs. **DLC**—Sample records show the characteristic discontinuities; the underlying theory and assumptions are discussed. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Ionospheric structure.**—*A.A.*

11E–88 621,396.11:551.510.535

†Lepechinsky, D., **Ionosphère (Commission III, XII ème Assemblée Générale de l'Union Radio Scientifique Internationale).** [Ionosphere (Report of Commission 3, 12th General Assembly of the International Scientific Radio Union).] *L'Onde Electrique*, Paris, 38(376):514–526, July 1958. figs., 67 refs. **DLC**—Report of work done by members of Commission 3 at the 12th general assembly of the International Scientific Radio Union. Regarding the lower ionosphere, the author examines the main ideas of the complete statement of results of Prof. Waynick's researches in this field (experimental data—probable constitution of the layer, lower E region). The important question of ionospheric scatter which was the object of a special meeting, was submitted by G. H. Booker. A certain number of experimental results were mentioned by various speakers on meteoric

and auroral reflections and on the turbulence in the ionosphere. The results of available obser tions, relating to solar and geophysical phenomena of February 23, 1956 (chromospheric eruptio were set forth by various speakers. *Subject Headings:* **1. Ionospheric diffusion 2. Chromosphe eruptions.**—*A.V.*

11E–89 523.164:551.510.535(

Little, C. Gordon; Merritt, Robert P.; Rumi, G. C.; Stiltner, Ernest and Cognard, Rene, **Ra properties of the auroral ionosphere.** Alaska. Univ. Geophysical Institute, Contract AF 30(63 2887, Quarterly Progress Reports, No. 1–5, 7, 8, June 1, 1956–May 31, **1958.** 1 piece (53 p 16 figs., 13 tables, 10 refs., numerous eqs. **DWB** (M94.6A 323ra)—This report describes the resu of more than twelve months operation of the 223 Mc and 456 Mc phase-switch interferomete The magnitude of the 223 Mc amplitude and angular scintillations effects have been determined an auroral latitude using two extraterrestrial radio sources. These magnitudes are discussed terms probability distributions, mean values, and diurnal, azimuthal, elevations, and source effe a) The probability of occurrence of each of the five main levels of 223 Mc scintillation activity given; b) Typical amplitude probability distributions and mean values of tractional deviation power are given for each of these indexes; c) Representative values of mean angular scintillati and probability distribution for angular scintillation are given for each main 223 Mc scintillat index; d) The diurnal variation for both sources shows a maximum of scintillation activity at abo magnetic midnight (~0140 AST), with a ratio of about 1.8 to 1 between maximum and minimu It is suggested that the activity is controlled in part by magnetic time; e) An azimuthal depende has been found for the Cygnus source, which scintillates most strongly when seen towards magne north (some 30 degrees east of true north). It is suggested that the activity is controlled in part the magnetic latitude at which the ionosphere is traversed; f) Both sources show very little variat of scintillation activity with zenith angle. (Cygnus covers the range 24 degrees zenith distance to degrees, Cassiopeia 6 degrees to 57 degrees.) This lack of zenith angle dependence is attributed the elongation of the irregularities along the earth's magnetic lines of force; g) The scintillat activities of the two sources are different. These differences are attributed to the larger subtens of the Cassiopeia source; h) A recent paper on the theory of radio star scintillations is modified take into account an elongation of the ionospheric irregularities along the magnetic field lines. N that the occurrence of radio star fades, as observed on phase-switch and phase-sweep interferomete has already been reported and described in Quarterly Progress Report No. 6. *Subject Headin* **1. Arctic ionosphere 2. Scintillation of radio stars 3. Ionospheric effects on radio astronomy** *Authors' abstract.*

11E–90 551.510.535:523.1

Little, C. G. and Leinbach, H., **Some measurements of high-latitude ionospheric absorpt using extraterrestrial radio waves.** *Institute of Radio Engineers, N. Y., Proceedings,* 46(1):334–3 Jan. **1958.** 21 figs., 2 tables, eqs. **DLC.** Separated pages issued as *Alaska. Univ. Geophysi Institute, Contributions, Ser. B,* No. 22, **1958. DWB**—Outline of the ionospheric absorption the is given along with description of instrumentation and methods of measurement. With the jectives of checking the geographical extent of the absorbing "clouds," diurnal variation, height absorbing region, correlation between magnetic activity and absorprion, and correlation betwe aurora and absorption, three different experiments with 30 Mc extraterrestrial waves were conduct 1) with rotating antenna, March 1955 at College, Alaska, 2) with two antennas, summer 1956 3) over a distance of 800 km between College and Barrow, Alaska, Spring 1957. The results cussed are presented in graphs and tables. Findings were: Absorption was greatest in north quadrant and extended well over 100 Km, and at least 800 km during disturbances. All absorpt occurs below E-region at about 60 Km. Pulsating and flaming auroras alone are intimately as ciated with major absorption, suggesting quite a different physical mechanism than other auror *Subject Headings:* **1. Ionospheric absorption of extraterrestrial radio waves 2. Radio wave absorpt in auroral region 3. Radio astronomy.**—*W.N.*

11E–91 551.510.535:621.39

Little, C. G. and Leinbach, H., **The riometer—a device for the continuous measurement ionospheric absorption.** *Institute of Radio Engineers, N. Y., Proceedings,* 47(2):315–320, Feb. 19 4 figs., 6 refs. **DLC**—A sensitive, self-balancing, noise-measuring equipment, known as the riomet is described. This instrument has been designed for routine measurement of ionospheric absorpt during the IGY, using the cosmic noise method. Application of this technique in the auroral zo has resulted in quantitative measurements of ionospheric absorption, even during polar blackou The riometer has the advantages over a simple total-power cosmic noise receiving system of 1) lin response to changes of input noise power, 2) high accuracy in the presence of narrow-band interference, and 3) good long-term stability. *Subject Headings:* **1. Riometer 2. Ionosphe absorption measurement techniques 3. Cosmic radio frequency radiation.**—*Authors' summary.*

11E–92 551.510.535:621.396.8

Luscombe, G. W., **Delayed signals in ionospheric forward-scatter communication.** *Nature*, London, 180(4577):138, July 20, **1957.** fig., 3 refs. **DWB**—VHF signals received in the United Kingdom from Gibraltar with a delay of 140 msec are attributed to round the world propagation. *Subject Heading:* **1. Ionospheric propagation.**—*C.E.P.B.*

11E–93 621.396.67:551.510.62:551.510.535

Macmillan, R. S.; Rusch, W. V. T. et al., **Very-low-frequency antenna for investigating the ionosphere with horizontally polarized radio waves.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 64(1):27–35, Jan./Feb. **1960.** 13 figs., 12 refs., 16 eqs. **DWB, DLC**—The advantages of a horizontal half-wave resonant antenna for very-low-frequency propagation experiments lie in its relatively simple and inexpensive construction and in its radiation pattern which is maximum in the vertical direction. The radiation fields of this type of antenna located at the surface of a conducting earth consist of: 1, A horizontally polarized space-wave radiated in the perpendicular bisector plane of the antenna; and 2, a vertically polarized ground-wave field radiated along the axis of the antenna. This vertically polarized field is zero at right angles to the antenna. These fields have been experimentally verified. The use of a 50-kilocycle horizontal half-wave antenna for vertical-incidence ionospheric sounding experiments is described. The radiation pattern of this antenna is well suited for ionospheric soundings since a receiver located in the groundwave null receives only the reflected skywave signal. Ground-resistivity measurements made at a number of locations in Central and Southern California were correlated with the geology of the terrain. This correlation showed that the ground resistivity is highest (a condition necessary for optimum antenna efficiency) in areas where the underlying rock formations are relatively unfractured. The amount of annual rainfall and other climatic conditions have little or no effect on the resistivity. Finally, a unique antenna system is presented which employs resonant loading circuits to convert a section of an existing power line into a horizontal half-wave very-low-frequency transmitting antenna. *Subject Headings:* **1. VLF antennas 2. VLF radio wave propagation. I. Golden, R. M.**—*Authors' abstract.* Ⓢ

11E–94 551.510.535:061.2

Manning, L. A. (*Stanford Univ., Calif.*), **Report on URSI Commission III, Ionospheric Radio Propagation.** *Institute of Radio Engineers, Proceedings*, 46(7):1362–1366, July **1958.** Also issued as *National Research Council, Wash., D. C., Publication*, No. 581:51–101, **1958. DWB, DLC**—The technical program was divided into 8 parts: 1) lower ionosphere, 2) geomagnetic influences on ionosphere, 3) whistlers, 4) geomagnetic storms, 5) horizontal movements in ionosphere, 6) scattering in ionosphere, 7) solar flare of Feb. 23, 1956, 8) rocket exploration of ionosphere. A fairly complete summary is given of progress reported at the meeting on each of these subjects. *Subject Heading:* **1. Ionospheric radio wave propagation commission reports.**—*M.R.*

11E–95 551.594.12:551.590.25:621.396.9

†Manning, L. A. and Eshleman, V. R., **Meteors in the ionosphere.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(2):186–199, Feb. **1959.** 7 figs., table, 65 refs., 32 eqs. **DLC**—When meteors enter the lower E region of the ionosphere, they produce trails of ionization. Sensitive radio systems at frequencies of 3 to 300 mc can record echoes from these ionized trails at rates of thousands per hour. Study of these echoes has benefited astronomy, the physics of the upper atmosphere and radio communication. This paper presents a review of the nature of meteoric echoes and describes the principal uses of meteors as research tools. Some of the directions in which further meteoric research may prove profitable are suggested as well. When the results of the IGY programs are correlated we may expect the knowledge gained from the study of meteors to play an important role. *Subject Headings:* **1. Meteor ionization trails 2. Meteor echoes.**—*Authors' summary.* Ⓢ

11E–96 551.509.5:551.510.535:621.396.1

Meek J. H. (*Radio Physics Lab. Ottawa*) **Prediction techniques at high latitudes.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956. **Proceedings, Pt. 2, Ionospheric Section.** N. Y., Pergamon Press, **1958.** p. 101–107. 8 figs.) Also issued in *Journal of Atmospheric and Terrestrial Physics*, London, Special Supplement, Pt. 2, 1957, pub. **1958.** p. 101–107. **DWB, DLC**—The method of HF predictions developed in Canada is designed for application to high latitude and polar communication circuits. Objections to the present system of group predictions are raised. The Canadian system is based on the linear relationship between the critical frequency and the sunspot number, $F = A + BS$ where F is the critical frequency; S the sunspot number and A and B, constants. The relation between the critical frequency and the sunspot number and the variations between zero intercept and the time of day at one particular station for different seasons of the year, are shown in the illustrative figures. An example of an oblique incidence record is given from which the separation between ordinary and extraordinary traces is visible. Five results of some previous

experiments are cited. This method of predictions has reduced the work involved in making t prediction charts. *Subject Headings:* **1. Ionospheric forecasts 2. Radio propagation predictio** —*N.N.*

11E–97 551.510.535:551.510.62:621.396

†Merrill, R. G., **Radiation patterns in the lower ionosphere and Fresnel zones for elevat antennas over spherical earth.** *U. S. National Bureau of Standards, NBS Report, 5599*, Sept. **1958.** 68 p. 20 figs., 9 tables, 21 refs., eqs. **DWB** (621.384 U585rad)—Patterns of elevat antennas produced by reflection from spherical earth have been computed incorporating parall refraction, tropospheric defocusing, spherical divergence, and near-horizon diffraction. Anter siting data are given for standard refracting at VHF for a scattering height of 85 km: 1. Anten height and elevation angle for placing the maximum of the first lobe at the path midpoint. 2. Di tances from the antenna which define the first Fresnel zone. 3. Data for determining obstacle effe and the elevation of the *zero phase surface* in the Fresnel zone: this concept is introduced as a n basis for obstacle criteria. These patterns and those for a temperate over-water refraction, a siting data for the latter case, will be published as appendices. A preliminary computation *optimum* antenna height is given which indicates that a considerable range of heights *lower* th those given in (1) will have a greater or equal gain. *Subject Headings:* **1. Fresnel zones 2. Optimu antenna height.**—*Author's abstract.*

11E–98 621.396.67:551.510.535:621.396

Merrill, R. G., **Optimum antenna height for ionospheric scatter propagation.** *U. S. Natio Bur. of Standards, NBS Report, 6047*, March 18, **1959.** 13 p., 8 figs., 10 refs., 2 eqs. **DWB**—Rad tion patterns of elevated antennas over spherical earth for scatter propagation in the lower ionosphe incorporation refraction, parallax, spherical divergence, and tropospheric defocusing have been us to compute the height gain function resulting from raising and lowering symmetric transmitt and receiving antennas for a fixed path length. This height gain function shows that a broad ran of *lower* antenna heights has a gain over that antenna height computed with the same model wh places the maximum of the first lobe at the path mid-point. The maximum of this function defined as the optimum antenna height. *Subject Headings:* **1. Optimum antenna height 2. Ion spheric scatter propagation.**—*Author's abstract.* Ⓢ

11E–99 551.510.535:551.510.62:621.39

†Millman, George H. (*General Electric Co., Syracuse, N. Y.*), **Analysis of tropospheric, ionosphe and extraterrestrial effects on V.H.F. and U.H.F. propagation.** *General Electric Co. Electronics D Technical Information Series*, R56EMH31, Oct. 6, **1956.** 138 p. 68 figs., tables, 50 refs., numero eqs. Photostat copy. **DWB** (M94.7 M655an)—Effects of the atmosphere and extra-terrestr noise sources on the propagation of VHF and UHF radio waves are discussed. Relationships derived for calculating refraction effects, time delays, Doppler errors, polarization changes a attenuation of radio waves traversing the atmosphere. These conclusions were reached. Refracti and time delay effects in the troposphere are independent of frequency and are a direct function relative humidity in the air. In the ionosphere refraction and time delay errors, polarization shi and attenuation are inversely proportional to the square of frequency. The Doppler frequency er in the troposphere is directly proportional to frequency while in the ionosphere is inversely propo tional to frequency. The theoretical total radiation from the quiet sun, in the radio frequen spectrum, is directly proportional to frequency raised to about the 0.755 power. The total f density emanating from radio stars, Cassiopea and Cygnus, is inversely proportional to the frequen raised to the 0.81 power. *Subject Headings:* **1. Ionospheric VHF propagation 2. Tropospheric VH propagation 3. VHF radio wave propagation 4. UHF radio wave propagation 5. Radio noise** *Author's abstract.*

11E–100 551.510.535:551.510.62:621.39

Millman, G. H., **Atmospheric effects on VHF and UHF propagation.** *Institute of Radio E gineers, Proceedings*, 46(8):1492–1501, Aug. **1958.** 16 figs., 4 refs., 53 eqs. **DLC, DWB**—This rep discusses the effects of the troposphere and ionosphere on the propagation of VHF and UHF ra waves. In order to accurately calculate the refraction effects, time delays, Doppler errors, polari tion changes and the attenuation experienced by radio waves traversing the entire atmosphere, t author has derived some mathematical relationships. Tropospheric refractive index profiles a ionospheric electron density models representative of average atmospheric conditions are also p sented in this paper. *Subject Headings:* **1. UHF radio wave propagation 2. VHF radio wave propag tion 3. Tropospheric radio wave propagation 4. Ionospheric radio wave propagation.**—*N.N*

11E–101 551.510.535:621.396.8:52

Mitra, A. P. (*Commonwealth Sci. and Industr. Res. Org., Div. of Radiophysics, Australia*) a Shain, C. A. (*Univ. of Calcutta, Inst. of Radiophys. and Electronics, India*), **The measurement**

onospheric absorption using observations of 18.3 Mc/s cosmic radio noise. *Journal of Atmospheric nd Terrestrial Physics*, London, 4(4/5):204–218, **1953.** 12 figs., 3 tables, 18 refs. **DWB**—A new echnique permits measurement of the total attenuation suffered by 18.3 Mc/s cosmic radio noise assing completely through the ionosphere. It is shown that the total absorption may be divided nto two components, one due to absorption mainly in the D region and the other in the F2 region. The observations of D region absorption confirm the diurnal and seasonal variations observed by other workers. F2 absorption depends on the critical frequency but not on the height of the region nd there is evidence of increased absorption at night which may be caused by irregularities in the pper F region. The observational results are compared with those obtained by other workers nd suggestions are made for the use of the method, particularly in the exploration of the upper F2 egion. *Subject Headings:* **1. Ionospheric absorption measurement 2. Solar radio noise.**—*Authors' bstract.*

11E–102 551.510.535:551.510.62:621.396.8

Mitra, S. N., (*all, India Radio, New Delhi*), **Effect of ionospheric irregularities on the variations of phase-path and amplitude of a downcoming wireless wave.** *Journal of Scientific and Industrial Research, Sec. B*, New Delhi, 11(11):453–454, Nov. **1952.** fig., 2 refs. **DWB, DLC**—Brief discussion of the results of simultaneous record change of the phase-path and the variation of the amplitude of the same downcoming wave. A pulsed transmitter of about 2 Mc/s was used. A typical example of the reflection from the normal E-layer is presented on a 35 mm film strip. According to the uthor's conclusion amplitude variations and phase discontinuities are due to the motion of an 'irregular ionosphere." *Subject Headings:* **1. Ionospheric reflection 2. Radio wave propagation.** —*W.N.*

11E–103 621.396.8:551.510.535

Miya, Kenichi and Kanaya, Sumio (*both, Kokusai Denshin Denwa Co., Ltd.*), **On the lateral leviation of radio waves coming from Europe.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 10(1):1–8, **1956.** 8 figs., table, 3 refs., 3 eqs. **DWB**—The gain of receiving rhombic antennas pointing in various directions was measured in Tokyo on waves coming from Europe. Lateral deviation was observed often followed by comparatively strong field intensity in the untransmissible period of the normal F2 propagation. From he results, the following two propagation modes are suggested for interpreting the propagation of the wave of frequency above F2-4000-MUF. One of them is the forward continental scatter by the F2 propagation off the great circle and the other is the forward ground scatter reflected by sporadic E clouds near the great circle covering the region of low MUF. *Subject Heading:* **1. Ionospheric radio wave propagation.**—*Authors' abstract.*

11E–104 551.510.535:551.510.62:621.396.11

Miya, K.; Ishikawa, Masaru and Kanaya, S., **On the bearing of ionospheric radio waves.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 11(3):130–144, Sept. **1957.** 11 figs., 13 refs., 5 eqs. **DWB**—This paper describes fluctuation and remarkable lateral deviation of bearing of the ionospheric HF waves, measured by using a new visual and recording type direction finder. As regards fluctuation of bearing, the relation between propagation mode and distance is explained. Three cases of lateral deviation are pointed out according to propagation modes of ground back scattering, continental forward scattering and antipodal propagation, and characteristics thereof are clarified. It is shown, in particular, that lateral deviation of the continental forward scatter is observed on a radio circuit in which the propagation mode is predominant and at times when the MUF on the great circle is lower than the frequency used. *Subject Heading:* **1. Ionospheric radio wave propagation.**—*Authors' abstract.*

11E–105 551.510.535:621.396.8

Munro, G. H. and Heisler, L. H. (*both, Electrical Eng. Dept., Univ. of Sydney*), **Divergence of radio rays in the ionosphere.** *Australian Journal of Physics*, Melbourne, 9(3):359–372, Sept. **1956.** 10 figs., table, 9 refs., eqs. **DLC**—Traveling disturbance manifestations on ionosonde records usually occur at different times on the "*o*" and "*x*" traces. It is shown that this is due to the divergence of the ordinary and the extraordinary rays in the earth's magnetic meridian plane and that the sense of this time difference, therefore, gives a direct indication of the sense of the north-south component of movement of the disturbance. Furthermore, where the direction and speed of travel of a disturbance can also be determined from spaced station observations, the actual separation of reflection points of the *o*- and the *x*-rays can be deduced. At Sydney, N.S.W. (33°52′S, 151°11′E) this is of the order of 30 km at the height of maximum ionization of the F2 region. On *h′t* records the corresponding time difference observed includes a component due to the vertical separation of reflection points if the front of the disturbance is not vertical. From records of this type taken at three spaced stations the horizontal component may be determined directly. Examination of some 430 such observations taken over a period of 4 years confirms the variation of the time difference

with direction of travel predicted by theory, and also indicates the consistent presence of a forwar tilt in the front of disturbances. The theoretical relation between the horizontal and vertic separation is then used to determine the slope of front of disturbances. It is found to have a mea value varying from 65° to the horizontal for disturbances traveling northward to a minimum of 5° for those travelling 120°E of N. *Subject Heading:* **1. Ionospheric disturbances.**—*Authors' abstract.*

11E–106 523.74:621.396.1

Naismith, R. (*Dept. of Scientific and Industrial Research, Slough*), **Solar activity and radi communication.** *Nature*, London, 181(4614):954–956, April 5, **1958.** 3 figs. **DWB**—The perio 1957–1958, one of highest solar activity within the past 200 years was chosen for the Internation Geophysical Year as most appropriate for observations of radio communication. The major even of the programme of the Radio Research Board are reported here. Sunspot number for Decembe 1957 was 244. The monthly median value of foF2 at noon at Slough during December was 15 Mc/s the longest in 26 years. The maximum frequency available for the longest-distance radi communication at the latitude of Slough is close to 50 Mc/s at noon for half the days in the month This can be applied in the planning of radio communication in the temperate regions. *Subje Heading:* **1. Solar-radio communication relationships.**—*N.N.*

11E–107 551.594.6:551.510.535:621.39

Northover, F. H. (*Dept. of Math., Carleton Univ., Ottawa, Canada*), **The propagation of electro magnetic waves in ionized gases (with special reference to "whistlers"), Pt. 1.** *Journal of Atmo pheric and Terrestrial Physics*, N. Y., 17(1/2):158–169, Dec. **1959.** 3 refs., 46 eqs. **Pt. 2,** *Ibid* p. 170–178. 35 eqs. **DWB, DLC**—Recent studies lend support to the theory that whistling a mospherics are caused by lightning flashes, the electromagnetic energy radiated by these bein guided along discrete columnar ionic irregularities which follow approximately the lines of forc of the earth's magnetic field. In Part I the theoretical problems arising are set forth and a genera wave theory developed which is first applied to the problem of propagation through homogeneou compound streaming media. In Part II the simplest case of "standard type" propagation alon stationary columns is carefully examined, both for columns with a central ionic surplus and fo columns with a central ionic deficiency. Although both types of column, when sufficiently we developed, can guide electromagnetic energy it appears that the former type is a much more likel mechanism for the whistler propagation than the latter. It is hoped in subsequent papers to dea with the propagation of general type disturbances along stationary columns and also through columr where appreciable axial streaming is taking place. *Subject Headings:* **1. Whistlers 2. Radio wav propagation.**—*Author's abstract.* Ⓢ

11E–108 551.510.535:551.510.62:551.594.

Obayashi, Tatsuzo; Fujii, S. and Kidokoro, T. (*all, Hiraiso Radio Wave Observ. Radio Res. Labs.*, **An experimental proof of the mode theory of VLF ionospheric propagation.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 10(2):47–55, **1959.** 7 figs., 10 refs. **DWB**—A new spectroscope recordin continuously the amplitude-frequency spectrum of VLF atmospherics has been developed. Th receiver sweeps the frequency giving complete coverage of the band of 5–7 kc/s repeatedly and th output is displayed on an intensity modulated cathode-ray tube, which is photographed on a slowl moving film. Observations have been carried out and it appears that the result provides an excellen experimental base for the mode theory of VLF ionospheric propagation. It is found that the fre quency-spectrum of distant atmospherics shows a broad intensity maximum around 10 kc/s an decreases its intensity towards higher frequencies with undulating peaks. Marked selective absorp tion bands appeared in the spectrum are variable according to the time of day, and they might b associated with cut off frequencies of the waveguide bounded by the earth and the ionosphere. Th solar flare effect on VLF atmospherics propagation is also revealed, which indicates a sudden shif of the spectrum to higher frequencies owing to the increase of ionization and the lowering of a reflect ing height of the ionosphere. *Subject Headings:* **1. VLF radio wave propagation 2. Ionospheri radio wave propagation 3. VLF sferics.**—*Authors' abstract.* Ⓢ

11E–109 551.594.6:551.510.535:621.396.1

Obayashi, T., **Very low-frequency spectra of atmospherics propagated through the ionosphere** *Nature*, London 184(4679):34–36, July 4, **1959.** 3 figs., 7 refs. **DWB**—A more complete experi mental proof of the mode theory in very low frequency ionospheric propagation and on the character istics of the atmospherics is given. Descriptive and experimental facts are presented from th observations of atmospherics at Ibaragiken, Japan. Typical records are examined. Among th facts that lend support to the mode theory is the relation between the sudden enhancement o atmospherics and the sudden ionospheric disturbances. *Subject Headings:* **1. Ionospheric VL propagation 2. Sferics propagation.**—*N.N.* Ⓢ

11E–110 551.510.535:551.510.62:551.594.6

Obayashi, T., **Measured frequency spectra of very-low-frequency atmospherics.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 64(1):41–48, Jan./Feb. **1960.** 12 figs., 11 refs., eqs. **DWB, DLC**—New spectroscopes recording continuously the amplitude-frequency spectra of VLF atmospherics have been developed. Two receivers cover the frequency ranges 1 to 10 kc and 5 to 30 kc sweeping the respective bands repeatedly, and their outputs are displayed on intensity modulated cathode-ray tubes which are photographed on slowly moving film. Observations have been carried out since June 1958, and its appears that the results provide an excellent experimental basis for comparisons with the mode theory of VLF ionospheric propagation. It is found that the frequency spectrum of distant atmospherics indicates a pronounced absorption near 3 to 5 kc, a broad intensity maximum around 10 to 20 kc, and a general decrease towards higher frequencies with undulating peaks. The selective absorption bands appearing in the spectrum are variable according to the time of day and seasons. These changes may be interpreted loosely as an ionospheric effect which is associated with the cutoff frequency of the waveguide bounded by the earth and the ionosphere. The solar flare effect on VLF atmospherics propagation is also revealed, which indicates a sudden shift of the spectrum to higher frequencies owing to the increase of ionization and the lowering of a reflecting height of the ionosphere. *Subject Headings:* **1. VLF sferics 2. Ionospheric radio wave propagation.**—*Author's abstract.* Ⓢ

11E–111 551.510.535:551.510.62:621.396.8

Okamoto, Hironobu; Ose, Masami and Aida, Kazuo (*all, Radio Res. Labs., Kokubunji, Tokyo*), **New type of scattering echo observed by the shipborne ionospheric sounder over the sea.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 11(2):50–54, June **1957.** 4 figs. **DWB**—On the first Japanese Antarctic research expedition (1956–57) from Japan to Singapore to Cape Town to Syowa Base and return, a new type of ionospheric sounding echo scattering was observed (as shown on recorder records) in a region up to 120 km above the surface for *h'f* records. No internal or instrumental failure could be found and, as shown on an hourly graph, a diurnal cycle was predominant (scatter mostly in daytime). Over-sea, land or ice propagation showed differences in type of scatter, being weaker over land or ice than over sea. It apparently is due to tropospheric conditions. *Subject Headings:* **1. Ionospheric sounder echoes from troposphere 2. Scattering echoes over sea 3. Japanese Antarctic.**—*M.R.*

11E–112 551.510.535:551.594.12:551.510.62:621.396.1

Ortner, Johannes and Egeland, Alv, **Aussergewöhnliche Ausbreitungsbedingungen für ultrakurze Wellen.** [Unusual propagation conditions for ultrashort radiowaves.] *Archiv der Elektrischen Übertragung*, Stuttgart, 13(10):420–428, Oct. **1959.** 7 figs., 6 tables, 16 refs. **DLC**—At the Kiruna Geophysical Observatory in Kiruna, Sweden (67.8°N, 20.4°E) radio waves of Central European VHF transmitters could be received within the period February 1958 to August 1959. These quite unusual conditions for frequencies of 90 Mc/s occurred only five times, and this during the summer months. It is difficult to find a close relation between geophysical or solar events and these unusual conditions of propagation, which occurred during geomagnetically undisturbed and disturbed days. Different processes of propagation are discussed: forward scatter, meteor trail ionization, auroral E layer, and Es layer. A quite specific sporadic Es layer gives the best explanation for these unusual receiving conditions. Critical frequencies observed near the reflection point of the received radio waves are of the order of the values computed with Appleton-Hartree formula, assuming an Es propagation. *Subject Headings:* **1. Radio wave propagation 2. Ionospheric scattering 3. E layer ionization.**—*A.V.* Ⓢ

11E–113 551.594.5:551.510.62:621.396.1

Ortner, J (*Kiruna Geophysical Obs., Kiruna, Sweden*), **Around-the-world echoes observed on a transpolar transmission path.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2464–2467, Dec. **1959.** 3 figs., table, 4 refs. **DLC**—Auroral influence on the 5200 km long communication path, 17.900 and 24.025 Mc/s respectively, of the three backscatter sounders used, is discussed here. Multipath studies were studied Dec. 23, 1958–Feb. 24, 1959. The results are presented in table and graph. It was found that the field strength of the world travelling signal at times was not more attenuated than a direct propagated pulse. *Subject Headings:* **1. Auroral effects on radio propagation 2. Radio wave transmission ducts.**—*W.N.* Ⓢ

11E–114 551.507.362.2:551.510.535:551.510.62:621.396.8

Paetzold, H. K. and Zschröner, H. (*both; Max-Planck-Inst. für Stratosphärenphysik, Weissenau*), **Radiobeobachtungen auf 20 MHz der ersten russischen Erdsatelliten.** [Radio observations at 20 Mc/s of the first Russian satellite.] *Telefunken-Zeitung*, Berlin, 31(320):99–104, June **1958.** 8 figs., 5 refs. French summary, p. 99; English summary p. 104. **DWB** (629.1388 P126ra)—Analysis of the Doppler effects of the 20 Mc/s radio signals from the Sputniks I and II yielded the

horizontal structure of the ionosphere discussed here. The radio observations were conducted at th Institute of Stratospheric Physics, Weissenau, Germany and the optical observations at the Tel funken Triangulation Laboratory, Ulm. The 2–3 min fadings discussed in terms of the Cotto Mouton effect and the Faraday effect indicate extension of ionospheric irregularities to 1000–2000 km The existence of focussing elements, also horizontally oriented over 100–200 km is plausible. A for of "guidance" due to ionospheric refraction, rather than scattering, may enhance the 6000 km wav path. Excellent graphs and reproductions of the original film recordings are given. *Subject Hea ings:* **1. Ionospheric structure 2. Satellite ionospheric fine structure studies 3. Ionospheric rad wave refraction.**—*W.N.*

11E–115 551.510.535:621.396.

Pfister, W. and Keneshea, T. J., **Ionospheric effects on positioning of vehicles at high altitude** *U. S. Air Force. Cambridge Research Center. Air Force Surveys in Geophysics*, No. 83, March **1956** 27+p. numerous figs., table, 7 refs., numerous eqs. **DWB, DLC**—When a radio wave penetrate the ionospheric region, the presence of free electrons there causes it to deviate from its straight lin path. The predictable part of this effect has been computed in terms of error in the initial angle propagation and the error in the range of points in the ionized region. The results are contained i a series of graphs. The maximum error for a frequency of 1000 Mc/s is of the order of 0.1 mil an 45 meters respectively; these values being inversely proportional to the frequency. The unpredic able part of the effects of the ionosphere is randomly varying and unknown in its details, especiall the dependence on frequency. From known facts of the ionospheric irregularities and from the retical considerations a justifiable estimate of the effects can be obtained. This estimate is base on the angular spread and other quantities derived from ionospheric drift measurements and on a experimentally confirmed frequency dependence law. *Subject Headings:* **1. Ionospheric radio wav reflection 2. Ionospheric drift.**—*Authors' abstract.*

11E–116 551.510.535:621.39

Piddington, J. H., **The four possible waves in a magneto-ionic medium.** *Philosophical Magazine* London, 7 ser., 46(381):1037–1050, Oct. **1955.** 2 figs., 14 refs., 16 eqs. **DWB.** Also: **The fou possible waves in ionized gas in a magnetic field.** *Nature*, London, 176(4488):875–876, Nov. 5 **1955.** fig., 10 refs. **DWB**—Discussion of the properties of radio waves propagated through ionize gas permeated by a magnetic field. Besides the ordinary and extraordinary waves (identical wit radio O and E waves) there is a 'magnetic-sound wave at low frequencies and an analogous wav at high frequencies termed the 'magnetic-plasma wave, which may be important in the origin o intense non-thermal solar radio emission. The relation between these four waves is studied. "Th magneto-ionic medium is quadruply refracting, transmitting 4 different waves." *Subject Headings* **1. Radio wave propagation 2. Solar radio noise.**—*C.E.P.B.*

11E–117 621.396.11:551.510.535:523.7

Pierce, J. A. (*Cruft Laboratory, Harvard Univ.*), **VLF phase shifts associated with the disturbanc of February 23, 1956.** *Journal of Geophysical Research*, Wash., D. C., 61(3):475–483, Sept. **1956** 6 figs., table, 4 refs. **DLC**—During the magneto-ionic disturbance following a solar flare at abou 03^h 34^m U.T. on February 23, 1956, the phase of a signal received at Cambridge, Massachusetts at 16 kc/s from a transmitter, at Rugby, England, was advanced by about 44 microseconds or 250° The peak Doppler effect on the received frequency occurred at 03^h 47^m, and corresponded approxi mately to a falling of the effective height of reflection at 1 km/min, assuming that the phase chang was produced solely by a change in height. The record of this phenomenon is contrasted with thos made during daytime sudden ionospheric disturbances. It is shown that in the latter case an increas in signal amplitude is observed at 60 kc/s but not at 16 kc/s ,and that there must be changes in th phase shift at reflection from the ionosphere, as well as changes in the height of reflection. Som comparisons are given between the time of occurrence of this phenomenon and the times of variou other effects of this disturbance that have already been reported. *Subject Headings:* **1. Ionospheri radio wave reflection 2. Solar flare effects on radio propagation.**—*Author's abstract.*

11E–118 551.510.535:621.396.

Piggott, W. R., **D.S.I.R. ionospheric absorption measuring equipment.** *Wireless Enginee* London, 32(6):164–169, June **1955.** 4 figs., 4 refs. **DLC**—The principles of ionospheric absorptio apparatus, first designed by Sir E. Appleton in 1935, are described with wiring diagrams. employs a very stable linear r-f pulse. *Subject Heading:* **1. Ionospheric absorption measurement.**— *C.E.P.B.*

11E–119 551.510.535:621.396.

Piggott, W. R., **The measurement of normal E-layer critical frequencies at night.** *Journal Atmospheric and Terrestrial Physics*, 7(6):341–342, Dec. **1955.** fig., ref. **DWB**—In measuring th

variation of absorption with frequency and time, the absorption band associated with critical frequency, plotted as $-\log \rho$ against log frequency, remains obvious. Some measurements at Slough are shown. *Subject Heading:* **1. Ionospheric critical frequency measurement.**—*C.E.P.B.*

11E–120 551.510.535:621.396.1

Piggott, W. R. and Bhattacharyya, J., **On the mode of propagation in the E-layer.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(1/2):150–157, Dec. **1959.** fig., 2 tables, 17 refs., 2 eqs. **DWB DLC**—Lepechinsky and Durant's suggestion—that foE is incorrectly interpreted at stations where the dip exceeds about 60°—is critically tested using observed foE data. All the tests agree in showing that this hypothesis is wrong, the critical frequency being reduced correctly for stations with dips up to 89°. The common type of Es trace extending approximately $f_H/2$ above foE interpreted by Lepechinsky as a magneto-ionic effect above fzE, is shown to be due to sporadic E and not magneto-ionic effect. It follows that the collisional frequency near the maximum of the E layer is of the order 10^4 sec^{-1} and not 10^6 sec^{-1} as required by Lepechinsky. *Subject Headings:* **1. Ionospheric radio wave propagation 2. E layer collisional frequencies.**—*Authors' abstract.* Ⓢ

11E–121 551.510.535:621.396.1

Pineo, V. C. (*M.I.T., Lincoln Lab., Lexington, Mass.*), **Off-path propagation at VHF.** *Institute of Radio Engineers, Proceedings*, 46(5), Pt. 1:922, May **1958.** 2 figs., 4 refs. **DLC**—A propagation experiment involving simultaneous measurement at Sterling, Va., and two off-path stations of signals beamed from Cedar Rapids, Iowa toward Sterling, is described and found to indicate that ionospheric scatter propagation consists of two modes, one due to solar influence, the other to meteoric ionization. *Subject Headings:* **1. Ionospheric scatter propagation 2. VHF radio propagation 3. Meteoric ionization.**—*G.T.*

11E–122 551.510.535:621.396.1

Poeverlein, Hermann, (*A. F. Cambridge Research Center*), **Low-frequency reflection in the ionosphere. Pt. 2.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 12(4):236–247, **1958.** fig., 24 refs., 9 eqs. **DLC**—The first part of the paper (*see* 10.2–177, Feb. 1959, *MAB*) dealt with a theory for ionospheric reflection of low frequencies, i.e. of wavelengths comparable to or great compared to the layer thickness. In the present second part various ranges of data are specified and their reflection characteristics are investigated. Metallic-type reflection is found at high electron concentration and dielectric-type reflection at medium electron concentration above a certain frequency limit. In this latter case, the currents in the ionospheric layer have the direction of the terrestrial magnetic field and the propagation in the layer is very peculiar. Some consequences of the theory are discussed with references to observations where possible. Among them there are statements about phase, sign, and Brewster case and possibilities of transmission through a layer. The final section brings some remarks on the theory, mainly on the field-strength quantities introduced. These quantities allow an interpretation which points at a close relationship to Budden's theory. *Subject Heading:* **1. Ionospheric radio wave reflection.**—*Author's abstract.*

11E–123 551.510.535:551.521.3

Poincelot, Paul, **Influence de l'absorption sur le coefficient de réflexion de l'ionosphère.** [Influence of absorption on the reflection coefficient of the ionosphere.] *Annales des Télécommunications*, Paris, 14(3/4):54–58, March/April **1959.** 15 refs., eqs. **DLC**—Study on the influence of absorption in the ionosphere on its reflection coefficient under normal incidence. Author investigates the propagation of a plane electromagnetic wave through a stratified medium, assuming that the electronic concentration varies linearly with respect to altitude. Generalizing the hypotheses made in several former publications, author introduces a viscous resistance and computes under these conditions the reflection coefficient of the considered ionospheric layer. The value of the reflection coefficient is expressed as follows: $|\rho| = e^{-4\beta w^2/3\alpha c}$ where w = pulsation of the wave; c = speed of light in the vacuum. β is determined by means of the ratio $\beta = r/m$ (m being an electron, possessing a speed v and subject, on the part of the medium, to a force $j = -rv$); α intervenes in the law of the index n fluctuation with respect to the height z above the basis of the ionospheric layer: $n^2 = 1 - \alpha z/w^2$. The adopted hypotheses correspond to reflection from the lower layers of the ionosphere. Numerous experimental verifications have been made. *Subject Headings:* **1. Ionospheric absorption 2. Ionospheric reflection coefficient.**—*A.V.* Ⓢ

11E–124 551.510.535:551.594.13:551.507.362.1

Quinn, T. P., **Coherent detection system for a rocket-borne ionospheric sounder.** Pennsylvania. State Univ. Ionosphere Research Lab., Contract DA-36-061-ORD-577, Scientific Report, No. 113, Dec. 15, **1958.** 63 p. 20 figs., 9 refs., eqs. **DWB** (M10.535 P415i)—An experiment proposed by the Ionosphere Research Laboratory is discussed. The experiment is designed to measure electron densities in the ionosphere by means of rocket-borne instruments. The preliminary

design for two rocket-borne coherent detection systems is presented. The detection system for daytime experiment is capable of detecting an ionosphere probe signal when the signal to no ratio is much less than unity. *Subject Headings:* **1. Rocket-borne instruments 2. Ionosphe electron densities.**—*Author's abstract.*

11E–125 551.510.535:621.390

Rao, B. Ramachandra and Ramana, K. V. V. (*both, Ionospheric Res. Lab. Andhra Uni Visakhapatnam*), **Diurnal variation of ionospheric absorption on 5.65 Mc/s at Waltair during t IGY.** *Journal of Scientific and Industrial Research, Sec. A*, New Delhi, 17(12), Special Supplemer Dec. **1958.** p. 56–58. table, 9 refs., 6 eqs. **DWB, DLC**—The equations used to obtain the ion spheric absorption by calculating comparatively the amplitude of the echo received with the a plitude if the ionosphere were a perfect reflector are given. Procedure and equipment used duri the period March–Aug. 1958 are described. Tabulated n values (cos x index) vary from 0.88 to 1.7 average 1.25 as against the theoretical 1.5. *Subject Heading:* **1. Ionospheric absorption calculatio** —*W.N.*

11E–126 551.510.535:621.396.

Reo, M. Srirama and Rao, B. Ramachandra, (*both, Ionospheric Res. Lab. Physics, Dept. Andh Univ.*), **Investigation of magneto-ionic fading in oblique incidence medium-wave transmissio** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 12(4):293–305, **1958.** 4 figs., 6 tables, 8 ref 18 eqs. **DWB**—Periodic fading of magneto-ionic origin observed in oblique incidence medium-wa records is interpreted theoretically by calculating the phase paths by a graphical integration meth assuming Chapman and parabolic ion distribution. Analytical expressions have also been deriv for phase paths of both magneto-ionic components by an approximate method involving the use an empirical formula for $q-x$ curves. The theoretical values of fading periods compared ve well with the experimental data, the agreement being particularly good for the case of Chapm distribution. *Subject Heading:* **1. Ionospheric fading.**—*Author's abstract.*

11E–127 551.510.535:551.507.362.2:621.390

Ratcliffe, J. A. (*Cavendish Lab., Cambridge Univ.*), **Information by radio from the satellite** *Institution of Electrical Engineers, London, Journal*, 4(47):603–608, Nov. **1958.** 7 figs., table, 2 re **DLC**—This article is a condensed form of a lecture dealing with some exploratory results of ion spheric research as obtained by way of radio signals from orbitting satellites, especially the Sputnik The propagation characteristics of the 20 and 40 Mc/s radio waves used permit deductions to drawn with regard to orbital features, ionospheric electron content, density and distribution, influen of earth's magnetic field, etc. Results deduced from the Doppler effect and the Faraday effect a discussed and shown in graphs. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Sat lite data recovery.**—*W.N.*

11E–128 551.510.535:551.510.62:621.390

Ratcliffe, J. A., **Microscopic mechanism for the absorption of radio waves in the ionosphe** (In: Beer, Arthur (*ed.*), **Vistas in astronomy.** pub. London, **1955–1956.** Vol. 2:791–798. 5 fig 2 refs., 30 eqs.) **DWB, DLC**—The paper deals with the absorption which occurs when a radio wa passes through a medium containing free electrons which make collisions with heavy particles. is shown that the absorption can be accounted for in terms of the impulses which the electro radiate at each collision under the influence of the imposed wave. Although these impulses a randomly timed they correspond to a coherent wave of the required amplitude and phase. *Subj Headings:* **1. Absorption of radio waves 2. Ionospheric radio wave propagation.**—*Author's abstra*

11E–129 551.510.535:621.390

Rawer, Karl (*Ionospheric Stat., of S.P.I.M., France*), **Some remarks concerning ionosphe absorption work.** *Journal of Geophysical Research*, Wash., D. C., 60(4):534–535, Dec. **1955.** f **DLC**—Monthly mean absorption decrements in E layer, as well as daily values, do not suppo assumption of a horizontally stratified plane ionosphere whose total absorption is characterized an effective reflection coefficient. Focusing effects arising from curvature in the reflecting lay produce an apparent reflection coefficient greater than 1. Effect is only important in vicinity focusing areas. Night F2 observations showed negative absorption decrement in 30% of cas Even in daytime, 2 or 3 daily observations show important focusing. These areas are illustrated being in the form of inverted ripples. *Subject Headings:* **1. Ionospheric focusing effects 2. Ion spheric structure.**—*M.R.*

11E–130 551.510.535:621.39

Rawer, K., **L'intensité du rayon dit de Pedersen.** [Intensity of the Pedersen beam.] *Acadé des Sciences, Paris, Comptes Rendus*, 243(11):797–798, Sept. 10, **1956.** table. **DLC**—Ionosphe communication between two points may be established by two different beams, the one with t

steeper angle of emission being called Pedersen beam. It is shown in this paper that (as generally known) the Pedersen beam usually has lower intensity than the regular beam. At certain frequencies, however (for example $f \leq 8.2$ MHz) this intensity relation can be reversed, which is attributed to a selective absorption effect. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Pedersen beam.**—*G.T.*

11E–131 551.510.535:551.594.13

Rawer, K. and Suchy, K., **Äquivalenztheoreme bei der Wellenabsorption im Plasma.** [Equivalence theorem in wave absorption by plasma.] *Annalen der Physik*, Ser. 7, 1(4/5):255–260, **1958.** refs., 23 eqs. **DLC**—Two calculations, one based on wave theory and one on radiation theory, show that (disregarding the geomagnetic field) Martyn's theory of ionospheric absorption is valid only if the attenuation is mostly due to collision and proportional to collision frequency. *Subject Heading:* **1. Ionospheric absorption.**—*Trans. of Authors' abstract.*

11E–132 551.594.5:551.510.535:621.396:523.164.42

Reid, G. C.; Stiltner, E. and Cognard, R., **Radio properties of the auroral ionosphere.** Alaska. Univ. Geophysical Institute, Contract AF 30(635)-2887, Final Report (Phase I), Feb. **1959.** 44 p. numerous figs., 19 refs., 15 eqs. **DWB**—It has been found in recent years that a study of the fluctuations in the signals received from radio stars affords a powerful means of investigating the irregular structure of the ionosphere. In 1955 studies of this type, using frequencies of 223 Mc and 456 Mc, were initiated at the Geophysical Institute, with a view to investigating the small-scale structure of the highly disturbed auroral ionosphere. The purpose of this report is to present a complete description of the initial experimental arrangement. Further developments of the equipment and some results of analysis of the data have been presented in Quarterly Progress Reports covering the period since June 1, 1956. The report is divided into three sections. Section I contains a description of the basic philosophy of the experiment with an elementary discussion of the various parameters involved. Section II contains a brief description of the actual field installation, and Section III is devoted to the electronic design features. The diagrams pertaining to each section are located at the end of the section. *Subject Headings:* **1. Ionospheric structure 2. Auroral ionosphere 3. Scintillation of radio stars.**—*Authors' abstract.* Ⓢ

11E–133 551.510.535:523.164

Reid, G. C. and Collins, C. (*both, Defence Res. Board, Ottawa, Canada*), **Observations of abnormal VHF radio wave absorption at medium high latitudes.** *Journal of Atmospheric and Terrestrial Physics*, London, 14(1/2):63–81, April **1959.** 7 figs., table, 23 refs., eq. **DLC**—A study of cosmic noise absorption at a frequency of 30 Mc/s at Ottawa and Churchill has revealed the existence of two apparently distinct types of abnormal absorption event. One of these is predominantly a night-time phenomenon and is closely associated with auroral and geomagnetic disturbance. It is suggested that this absorption may be caused by an increase in electron collisional frequency at E-region heights rather than by a large increase in electron density at lower levels. The second type of absorption is confined to the auroral zone and is predominantly a daytime phenomenon, recurring for several days after a large solar flare. Evidence is presented to show that this absorption is due to an increase in ionization at very low levels in the ionosphere. The cosmic noise measurements are supported by evidence from a number of VHF forward-scatter circuits in Canada, and this is used to obtain information about the geographical extent and frequency of occurrence of these abnormal absorption events. *Subject Headings:* **1. VHF radio wave absorption 2. Electron collision frequencies 3. Auroral absorption 4. Ionospheric absorption.**—*Authors' abstract,* Ⓢ

11E–134 551.510.535:621.396.8:538.56

Roy, R. and Verma, J. K. D. (*Inst. Nuclear Physics, Calcutta, India*), **Polarization of electromagnetic waves for vertical propagation in the ionosphere.** *Journal of Geophysical Research*, Wash., D. C., 60(4):457–482, Dec. **1955.** 17 figs., 3 photos, 19 refs., numerous eqs. **DLC**—A theoretical study of the variation of the state of polarization of a vertically incident electromagnetic wave while in propagation in the ionosphere has been made on the basis of an approximate solution of the wave equations obtained by Saha, Banerjee, and Guha. It has been shown that the major axes of the polarization ellipses of both the ordinary and the extraordinary waves would lie in the N-E quadrant in the Northern Hemisphere and in the N-W quadrant in the Southern Hemisphere. A new method has been outlined for the determination of the electron density and the collision frequency in the ionized layers from the value of the tilt-angle and the ratio of axes of the elliptic patterns. An analysis of the characteristics of the experimentally observed polarization patterns indicates that in E layer the value of v is 1.7×10^6 per second. They further show that the polarization of the downcoming waves corresponds to their respective reflection levels, rather than a limiting region below the E layer. *Subject Headings:* **1. Electromagnetic wave polarization 2. Electromagnetic wave propagation 3. Ionospheric radio wave propagation.**—*Authors' abstract.*

11E–135 551.510.535:621.396

Rudloff, D., **Ionosphärensturm und Wetterfunkdienst am 4. September 1958.** [Ionosphe storm and weather broadcasting service on September 4, 1958.] *Wetterlotse*, Hamburg, No. 136:22 223, Sept. **1958. DWB**—Ship observation of the phenomena which for hours silenced radio tra mission over a large area, is discussed briefly. *Subject Headings:* **1. Ionospheric storms 2. Rac wave propagation disturbances.**—*W.N.*

11E–136 551.510.535:621.396.1(0

Saxton, J. A., **Long-distance radio propagation above 30 Mc/s.** *Nature*, London, 181(461 1184–1187, April 26, **1958. DWB**—The London Institution of Electrical Engineers held a sy posium on Jan. 28, 1958 at which more than 20 papers dealing with British contributions to the stu of long-distance radio wave propagation at frequencies above 30 Mc/s were presented. Two velopments so far recognized in Britain are: the possibility of long distance communication betwe 1000 and 2000 km on frequencies exceeding the maximum usable frequency and that transmissi occurs via the E-region of the ionosphere and also through the troposphere. Brief summary some of the papers presented at the symposium are included. *Subject Headings:* **1. Radio wa propagation symposia 2. Ionospheric radio wave propagation.**—*N.N.*

11E–137 621.396.1:551.510.535:551.510

†Schmelovsky, Karl-Heinz, **Probleme der Ausbreitung in troposphärischen und ionosphärisch Wellenleitern.** [Problems of propagation in tropospheric and ionospheric wave guides.] *Germa Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, Abhandlung* 7(49):1–24, **1958.** 41 p. 14 figs., 2 tables, 23 refs., numerous eqs. **DLC**—An attempt is made find a general procedure for determining the propagation characteristic of a wave guide, in particu its propagation damping. In the derivation of these characteristics the author constructs a mo which describes the field in the wave guide as a process of interference of waves which are reflect at the limits. By using this model it is possible to retain the concept of the reflection factors. T problems considered include exclusively wave guides having a propagation constant that is ve complex as a result of radiation or reflection losses, thereby the boundary wave length looses fundamental importance; approximately spherical symmetrical guides are present; the ratio longitudinal to transverse measurements is usually substantially smaller than in the case of artific hollow guides. The mathematical treatment of the propagation in the case of homogeneous wa guides, in tropospheric wave guides and in homogeneous wave guides are presented and applicati and illustrations for the interpretation of sunrise effects on the atmospheric noise level, in the long wave lengths and propagation constants of tropospheric wave guides are given. *Subject Headin* **1. Wave guide mode theory of VLF radio wave propagation.**—*I.L.D.*

11E–138 551.510.535:551.510.62:621.39

Schwentek, Heinrich, **Bestimmung eines Kennwertes für die Absorption der Ionosphäre a einer automatisch-statistischen Analyse von Feldstärkeregistrierungen.** [Determination of ionospheric absorption coefficient by means of automatic-statistical analysis of field strength reco ings.] *Archiv der Elektrischen Übertragung*, Stuttgart, 12(7):301–308, July **1958.** 11 figs., 15 ref 14 eqs. **DLC**—A simple method is described by which the nondeviative absorption of the ionosph can be determined continuously by field strength measurements at oblique incidence. The conditio of a suitable transmission path are discussed. An analysis of the field strength frequency distributi measured by a statistical counter renders possible the separation of the main transmission paths fr each other. Thus absorption values for hourly intervals can be determined immediately. For t purpose the absorption values are reduced to vertical incidence. Furthermore the state of t ionosphere may be derived from the distributions. Thus the mean reflection coefficient of the layer at night as well as its frequency are immediately obtained. For the delayed diurnal variati of absorption dependent on the sun's zenith angle a simple formula is suggested. *Subject Headin* **1. Ionospheric radio wave absorption.**—*Author's abstract*

11E–139 551.510.535:621.396.67:551.594

Sechrist, C. F., Jr., **Theory and design of a traveling wave antenna system for long wave swe frequency investigation of the ionosphere at vertical incidence.** Pennsylvania. State Uni Ionosphere Research Lab., Contract AF 19(604)-1304, Scientific Report, No. 91, March 1, **195** 49 p. 16 figs., 8 refs., eqs. **DWB** (M10.535 P415i)—The analysis, design, and evaluation of t new combination 75 kc/s folded dipole antenna, 225 kc/s antenna, and long wave sweep frequen transmitting antenna system being erected at the Scotia Field Station are discussed. The syst to be used for long wave sweep experiments consists of a 6500′ long off-center fed transmission li antenna for frequencies between 50 and 220 kc/s and a 2000′ long centerfed transmission line anten for frequencies up to 800 kc/s. Taking into account ionospheric absorption and atmospheric no

vels for summer and winter days and nights, a comparison of required field intensity to overcome ionospheric noise and expected incident field intensity with the transmission line antenna is made for the frequency range 50–1000 kc/s. *Subject Headings:* **1. Radio propagation 2. Ionospheric absorption 3. Atmospheric noise levels.**—*Author's abstract.*

11E–140 551.510.535:551.508.96

Sechrist, C. F., Jr., **Instrumentation for long wave sweep frequency investigation of the ionosphere at vertical incidence.** Pennsylvania. State Univ. Ionosphere Research Lab. Contract AF 19(604)-3875, Scientific Report No. 103, June 1, **1958.** 96 p. 67 figs., 10 refs. **DWB** (M10.535 (15i)—The description and operation of the instrumentation for long wave sweep frequency investigation of the ionosphere is covered in this report. The beat frequency method of generating wide frequency sweeps is used in the 0.5 megawatt transmitter which covers the frequency range from 1 to 1000 kc/s. Transformer coupled, push-pull, wide-band amplifiers are employed in the transmitter providing class B operation with good waveform, and obviating the need for complex tuning arrangements. The transmitting antenna used for sweep operation is a 60 kc/s folded dipole that is converted to a balanced, transmission line antenna by an automatic switching arrangement. An automatic control system is described which permits unattended, alternate operation of the 60 Mc/s and long wave sweep transmitters. A sample *h'-f* record, obtained with the sweep equipment, appears near the end of the report. Recommendations for future development conclude the report, and the appendices cover the design procedures. *Subject Headings:* **1. Ionospheric research 2. Long wave sweep frequency instrumentation.**—*Author's abstract.*

11E–141 551.510.62:551.510.535:551.507.362.1

Seddon, J. Carl (*Naval Res. Lab., Wash.*, 25, *D.C.*), **Propagation measurements in the ionosphere with the aid of rockets.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W., eds., **Rocket exploration of the upper atmosphere.** London, *Pergamon*, **1954.** p. 214–222. 10 figs., 5 refs.) **DWB**—The upper atmosphere has been measured by the Naval Research Laboratory since 1946. Earlier methods used for measuring electron densities and the basic experiments performed are discussed. In 1949 it was observed that the electron density did not drop much above the E1 layer maximum. This caused the vertical heights of reflection to be far greater than the actual height of the reflection. A method of determining the harmonic-frequency system is described and is considered the best means of probing the secrets of the ionosphere when used with high altitude vehicles such as the V-2 rockets. *Subject Headings:* **1. Rocket ionospheric measurements 2. Ionospheric radio wave propagation.**—*N.N.*

11E–142 551.510.535:551.594.12

Seddon, J. C.; Pickar, A. D. and Jackson, J. E. (*U. S. Naval Research Lab., Wash., D. C.*), **Continuous electron density measurements up to 200 km.** *Journal of Geophysical Research*, 59(4): 513–524, Dec. **1954.** 9 figs., 11 refs., 6 eqs. **DLC**—Measurements in the ionosphere using the Seddon propagation technique were conducted with the Viking 10 rocket, launched at 10:00 a.m. EST on May 7, 1954, at the White Sands Proving Ground, New Mexico. This rocket reached a record altitude of 219 km, and provided very good data for both upward and downward trajectories. Ordinary and extraordinary indices of refraction at 7.754 Mc were measured in the region surrounding the rocket. From these indices, it was possible to determine accurately the electron distribution from 84 to 200 km. By using the *P'-f* records taken during the rocket flight, the electron density curve was extrapolated up to the maximum of the F2-region (2.9×10^5 el/cc at 288 km). The measurements showed a rapid increase in density from 1×10^4 el/cc at 91 km to 1×10^5 el/cc at 101 km. This was followed by additional but less rapid increases up to the peak of the F1-region (2.1×10^5 el/cc at 170 km). Densities in the 170- to 200-km region were, in general, five to ten per cent lower than the F1 maximum density. Although obtained during a period of low sunspot activity, these latest results agree remarkably well with previous results reported by Seddon and Jackson for periods near the sunspot maximum. In all cases, the daytime ionosphere was seen to remain dense throughout the E-region and up to the F1-region, with only occasional minor peaks in density. In all cases, the distribution obtained agreed very closely with the *P'-f* records. Sporadic echoes are apparently due to partial reflections from high gradient regions. *Subject Headings:* **1. Ionospheric electron density 2. Rocket investigations 3. Ionospheric refraction.**—*Authors' abstract.*

11E–143 551.510.535:551.507.362.1

Seddon, J. C. and Jackson, J. E., **L'application des fusées à l'étude de l'ionosphère.** [Application of rockets to the study of the ionosphere.] *Annales de Géophysique*, Paris, 11(2):169–172, April/June **1955.** 2 figs., 7 refs., eqs. **DLC**—Doppler measurements from rockets to determine electron density as a function of altitude to 160 and 300 km respectively, are shown graphically in two figures. Density was obtained by direct measurement to 200 km and by extrapolation using iono-

grams up to 300 km. *Subject Headings:* **1. Rocket soundings of ionosphere 2. Ionospheric electr density.**—*M.R.*

11E–144 551.510.535:551.510.62:550.3

Sethuraman, R. (*Physical Res. Lab., Ahmedabad*), **Rates of fading of reflected pulses of vertica incident electromagnetic waves at Ahmedabad on 2.6 and 4.0 Mc/s.** *Journal of Scientific a Industrial Research, Sec. A*, New Delhi, 17(12), Special Supplement, Dec. **1958.** p. 50–53. 4 fig table, 7 refs. **DWB, DLC**—Summarized results of the Physical Research Laboratory's observatio at Ahmedabad Oct. 1956–Mar. 1958 show that: (1) rapid fading <5 sec. period occurs mainly duri night hours and is somewhat dependent on magnetic activity; (2) low values of C_p is genera associated with more rapid fading, and the F2 reflections exhibited a marked correlation with t amount of spread of the p^1-f records; (3) nighttime F2 is sensitive to magnetic activities which d time E layer is not. *Subject Headings:* **1. Radio fading 2. Electromagnetic waves 3. F2 lay** —*W.N.*

11E–145 621.396.8:551.510.5

Shain, C. A., **Changes in the absorption of cosmic noise observed during two ionospheric d turbances.** *Journal of Atmospheric and Terrestrial Physics*, 7(6):347–348, Dec. **1955.** fig., 3 re **DWB**—Observed total absorption at Hornsby (34°S, 151°E) compares with foF2 at Brisbane a Canberra on Nov. 23–25 and Aug. 19–21, 1950. *Subject Headings:* **1. Ionospheric disturban 2. Radio noise 3. Ionospheric absorption.**—*C.E.P.B.*

11E–146 551.594.6:551.510.535:551.594.

Shammatt, F. H., **Atmospheric whistlers and the electron density in the ionosphere.** Tex Univ. Electrical Engineering Research Lab., Contract AF 19(604)-5504, Report 6-30, Oct. 21, 195 22 p. 6 figs., table, 10 refs., 25 eqs. **DWB** (M94.7 T355r)—Some of the electromagnetic ener released from lightning strokes travels a path through the ionosphere essentially parallel to t magnetic lines of the earth's magnetic field. It arrives at the ground in the opposite hemisphere a frequency dispersed wave train with time delay increasing with decreasing frequency. The exte of this dispersion has previously been shown to be a function of the height distribution of electr density in the ionosphere along the path traveled. This report presents a method of computing t dispersion from a knowledge of the electron density and compares observed and computed dispersi based on an assumed exponential electron density height distribution. The correlation between t two sets of curves is sufficiently good to lend credance to the assumed electron distribution. TI research was carried out as one phase of a general propagation study designed to investigate varic tropospheric and ionospheric refractive index distribution models. *Subject Headings:* **1. Ionosphe electron density 2. Whistlers.**—*Author's abstract.* Ⓢ

11E–147 551.510.535:621.39

Sharma, S. K. (*Radio Communication Lab. Eng. Coll. Banaras Hindu Univ.*), **Effect of therm expansion of the F2 region of the ionosphere on the absorption of high frequency radio wav** *Journal of Scientific & Industrial Research, Sec. A*, 18(1):17–20, Jan. **1959.** fig., 2 tables, 9 ref 5 eqs. **DWB, DLC**—The total absorption of radio waves in the ionosphere has been measured by t pulse technique at vertical incidence at different hours of the day. It has been found that f frequencies below the critical frequency of F1 layer, only one maximum of total absorption is ge erally observed while at frequencies sufficiently above the critical frequency of the F1 layer, t maxima, one before and the other after the local noon, are observed. The maximum observ before noon has been attributed to the thermal expansion of the F2 region of the ionosphere unc adiabatic equilibrium, the effect of which is more pronounced in the lower latitude. *Subject Hea ings:* **1. Thermal expansion of F2 region 2. Ionospheric absorption.**—*Author's abstract.* Ⓢ

11E–148 551.510.535:621.396.

Shearman, E. D. R., **Study of ionospheric propagation by means of ground back-scatter.** *I stitution of Electrical Engineers, London, Proceedings, Pt. B*, 103(8):203–209, March **1956.** 6 fig 12 refs. **DLC.** Also his: **The technique of ionospheric investigation using ground back-scatt** *Ibid.*, p. 210–223. 16 figs., 27 refs., 14 eqs. **DLC.** Also: Laver, F. J. M. and Stanesby, H., **E perimental test of reciprocal transmission over two long-distance high-frequency radio circui** *Ibid.*, p. 227–232. 6 figs., 9 refs., 3 eqs. **DLC.** Also: Meadows, R. W., **Experiment to test t reciprocal radio transmission conditions over an ionospheric path of 740 KM.** *Ibid.*, p. 224–22 6 refs. Discussion of all papers, p. 232–235. **DLC**—This series of papers and the discussion p. 232–235, covers many phases of a systematic program conducted during 1949–55 in the Briti Isles to obtain data on the back scatter, skip distance, ionospheric layers involved and height there for one to four hop (up to 11,000 mi) propagation. It was found that better results were obtain in winter than in summer, that the distances were shorter than calculated, and that only about 1

the cases showed distinctly different reception in one direction than in another. Also the main portion of energy is scattered back by the ground, rather than by the ionosphere as many authors theorized. In summer the energy is distributed over a considerable time with several peak bands corresponding with reflection from several ionospheric layers. In winter only 1 major band (return one) is noted—that for F layer. The vertical incidence pulses do not give exactly the same calculated height and skip distance as the oblique pulse signals. Perhaps returns come from outside in the edge of the calculated beam. *Subject Headings:* **1. Ionospheric radio wave propagation Ground back-scatter.**—*M.R.*

11E–149 551.510.535:621.396.1

Silberstein, Richard (*Nat. Bur. of Stands., Boulder, Colo.*), **A long-distance pulse-propagation periment on 20.1 megacycles.** *Journal of Geophysical Research*, Wash., D. C., 63(3):445–466, pt. **1958.** 10 figs., 3 tables, 15 refs., 6 eqs. **DLC**—A pulse-propagation experiment was performed tween Sterling, Virginia, and Maui, Territory of Hawaii, with the object of studying the mechanism termining the classical MUF at long distances, and also of obtaining a general idea of the mode ucture. Simultaneous oblique-incidence records of the transmitter pulses were made at Boulder, olorado, which lies along the path. Some backscatter records were obtained at the transmitter e; and vertical-incidence records were made at the midpoint of the Sterling to Boulder portion the path. Results showed greatly differing mode structures between one day and the next, dicating that the long path is very sensitive to ionospheric conditions, and also that M and N flection and layer tilts play an important part. Experimental evidence was strong that sporadic-E nization enables the propagation of a wave over the path where F2 ionization at one end of the path not sufficient for reflection.—*Subject Heading:* **1. Ionospheric radio wave propagation experiments.** *Author's abstract.*

11E–150 551.510.535:621.396.11

Singh, B. N. and Ram, R. L. (*both, Physics Lab., Patna Univ., Patna*), **Rhythmic fading of hort-wave radio signals.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(1/2):145–155, ct. **1959.** 5 figs., 9 refs., 16 eqs. **DWB, DLC**—The problem of periodic fading due to interference a number of components of a sinusoidal radio signal has been theoretically treated by considering as equivalent to determining the resultant of a number of simple harmonic vibrations of nearly ual frequencies. The practical bearing of the results so obtained to fading curves of magneto-ionic igin particularly those caused by interference of three and four components has been discussed. number of typical fading curves for short-wave radio signals transmitted from Delhi and Calcutta ve been described. Particular reference may be made of curves which are very likely of magneto-nic origin and depict the complete sequence of events expected when the value of the m.u.f. r the F2 layer passes across the signal frequency due to the increase or decrease of the ionic nsity of the layer. Fading curves which have been ascribed to interference between waves singly nd doubly reflected from F2-layer and also those which are apparently caused by interference be-ween waves simultaneously reflected from F2 and E layers have also been described and their atures discussed. An example has also been given of such fading curves whose origin appears to be bscure. *Subject Headings:* **1. Short wave radio fading 2. Radio fading patterns.**—*Authors' bstract.* Ⓢ

11E–151 551.510.535:621.396.1

Singh, R. N. and Murty, Y. S. N. (*both, Wireless Lab., Dept. of Physics, Banaras, Hindu Univ.*), **imiting polarization curves for radio wave propagation in the ionosphere.** *Current Science*, Banalore, 27(5):161–162, May **1958.** 2 figs., 6 refs., 5 eqs. **DWB, DLC**—At Banaras (dip angle: 6°26′N) a study of the values for θ and ψ, the multiples and submultiples of the gyromagnetic wave ngths λ_H has been made. The conformal method of representing the polarization of a radio ave propagated through the ionosphere in the presence of earth's magnetic field by the above ymbols is still retained. A conclusion is reached that the limiting values of $\theta = 45°$ and $\psi = 0$ occur nly when the wavelength is less than $\frac{1}{3}$ of the gyromagnetic wavelength. The critical collision frequency was calculated as 4.49 Mc/s, when the total magnetic intensity is 0.446 Gauss. *Subject Headings:* **1. Radio wave polarization 2. Ionospheric radio wave propagation.**—*N.N.*

11E–152 621.396.1:551.510.535:551.510.62

Sinno, Kenzi (*Hiraiso Radio Wave Observatory, Radio Research Laboratories*), **On radio propagation disturbances.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 10(3):143–147, **1956.** 5 figs., 2 refs. **DWB**—Two types of geomagnetic storms re discussed in relation to forecasting of radio communication conditions. The more severe effect n radio propagation is found to arise from the 27-day recurrence storm period linked to the M-region nd coinciding frequently with the passage of the calm region of the solar surface of the sun's central eridian. The other nonrecurrent but effective storm type is related to the active region of the sun.

Accuracy of forecasting radio communication conditions is conversely proportional to solar activi
Subject Headings: **1. Radio wave propagation disturbances 2. Radio communication forecasti
3. Geomagnetic storm effects in radio communication.**—*W.N.*

11E–153 551.510.5

Smith, E. K. and Knecht, R. W. (*Natl. Bur. of Stads., Boulder, Colo.*), **Some complications
slant-Es.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 2, Ionosphe
Section.** N. Y., Pergamon Press, **1958.** p. 195–204. 14 figs., 12 refs., 4 eqs.) Also issued
Journal of Atmospheric and Terrestrial Physics, London, Special Supplement, 1957, Pt. 2, pub. 19
p. 195–204. **DWB, DLC**—Three examples of slant Es observed at College, Alaska on Feb. 27, 19
are shown in ionograms. Cases of low latitude Es are also presented for the sake of comparis
Ionograms of slant-Es, the linear representation of measured and computed slant Es curves, t
application of caustic focussing to slant Es through analogy to Dieminger's ground scatter case, t
possible modes of slant-Es, the field strength at frequencies near 2370-MUF, the isotropic case
scattered power referred to back-scatter, deviations β from specular conditions and some famil
of theoretical slant-Es curves, are illustrated. A feature of slant-Es reported by Agy in a priva
communication in 1951 is plotted on a linear instead of the semi-logarithmic scale. *Subject Hea
ings:* **1. Slant-Es 2. Sporadic E layer 3. Alaska.**—*N.N.*

11E–154 551.510.535:523.

The solar flare of February 23, 1956. *Discovery*, 17(5):177–179, May **1956.** 4 figs. **DLC**
Increasing area of sunspots occurred in Feb. 1955 and a large flare on Feb. 23, 0330–0510 U.T.
Kodaikanal. An increase of about 6% in cosmic radiation was reported. There was a comple
fade out of short-wave radio. *Subject Headings:* **1. Solar flares 2. Ionospheric disturbances.**
C.E.P.B.

11E–155 621.396:551.506.

Southworth, Mason P. (*ARRL-IGY Project Supervisor*), **The ARRL-IGY propagation researc
project.** *American Geophysical Union, Transactions*, 39(5):995–997, Oct. **1958. DWB, DLC**
Outline of program, the reporting and recording of data, the circulation of PRP news among t
observers and the further uses of the propagation research data during the IGY are discusse
Subject Headings: **1. IGY radio meteorological program 2. U. S. participation in IGY.**—*N.N.*

11E–156 551.510.535:621.396

Stein, Sidney (*Ionosphere Research Laboratory, Penn. State Univ.*), **The role of ionospheric-lay
tilts in long-range high-frequency radio propagation.** *Journal of Geophysical Research*, Wash., D. C
63(1):217–241, March **1958.** 11 figs., 16 refs., 1+ eqs. **DLC**—The role of ionospheric-layer tilts
long-range HF and VHF radio propagation is discussed. A derivation of the ray trajectories for
simple ionospheric model is given. The characteristic ranges on the radio frequencies observe
between 12 Mc and 30 Mc are the same; but sometimes there is a complete absence of intervenin
ground backscatter. The back scatter from the distant E region and the reflection from the upp
side of the E layer are very noticeably associated with F-layer tilts. *Subject Headings:* **1. Ionospher
layer tilt 2. Ionospheric radio wave propagation.**—*N.N.*

11E–157 551.510.535:621.396.

Straker, T. W., **The ionospheric propagation of radio waves of frequency 16 kc/s over sho
distances.** *Institution of Electrical Engineers, London, Proceedings, Part C*, 102(1):122–133, Marc
1955. 18 figs., 18 refs. **DLC**—Investigations carried out between March 1948 and Oct. 1949 ov
a 90 km path from Rugby to Cambridge at 17 kc/s. The abnormal component of downcomi
wave was isolated and measured separately. Results show reflection occurred from height of 72 k
in daytime and 87 km at night, with apparent height of reflection varying with zenith angle of su
(16.8 km in summer and 13.5 km in winter). Diurnal cycles of amplitude change and phase chan
occurred independently. Sunrise effect on amplitude occurs 1 hour before effect on phase. N
evidence was found of waves reflected twice from ionosphere. During and after magnetic storm
diurnal variations were abnormal (for as long as 10 days). *Subject Heading:* **1. Ionospheric rad
wave reflection.**—*M.R.*

11E–158 551.510.535:621.396.

Thomas, J. A. and McNicol, R. W. E., **Automatic recording of the direction of arrival of rad
waves reflected from the ionosphere.** *Institution of Electrical Engineers, London, Proceedings, Pt.*
102(6):793–799, Nov. **1955.** 11 figs., table, 10 refs. **DLC**—Equipment is described which, for
fixed frequency, simultaneously determines the direction of arrival of all resolved pulses reflecte
from the ionosphere by measuring the phase differences for two pairs of fixed orthogonal spaced-loo
aerials. The vector sum and difference of the signals for each pair of loops in turn are formed in

pecial unit. These are amplified in normal receivers and the rectified video outputs applied to the - and *X*-plates respectively of a cathode-ray tube. The orientations of the resulting lines are thus overned by the phase differences between the signals at the pairs of loops. Pulse resolution is chieved by the simultaneous application of a time-base in the *X*-direction. Phase-balanced ceivers are not required; since the phase-sensitive portion of the equipment is confined to the loops, e-amplifiers and the sum-and-difference unit, the system is stable enough to run without attention r up to one week. *Subject Headings:* **1. Ionospheric radio wave reflection 2. Radio direction nders.**—*Authors' abstract.*

11E–159 551.510.535:621.396.1

Titheridge, J. E. (*Cavendish Lab., Cambridge*), **Variations in the direction of arrival of high-requency radio waves.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(1/2):17–25, Dec. 1958. 2 figs., 4 refs., 9 eqs. **DLC**—A general relation is derived for determining the effect f a nonhorizontally uniform ionosphere on the propagation of short radio waves. The deviations or linear and parabolic layers are evaluated and the results generalized to include an ionosphere ith several layers. Some experimental results showing large diurnal changes in apparent bearing re discussed and shown to be consistent with the foregoing theory. *Subject Heading:* **1. Ionospheric adio wave propagation.**—*Author's abstract.*

11E–160 551.510.535:621.396:551.507.362.2

Uyeda, Hiroyuki, Shibata, Hisashi; Mambo, Masayoshi (*all, Radio Res. Labs.*) and Ishida, adashi (*Kanto Radio Regulatory Board*), **On the reception of radio waves from Sputnik I.** *Japan. cience Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 12(1):37–9, 1958. 2 figs. **DWB, DLC**—A short note analysing the satellite's orbits obtained from the ata observed at the Monitoring Division, Kuiki Radio Regulatory Bureau, Ministry of Posts & Telecommunications and from the ephemeris given by the Smithsonian Astrophysical Observa-ory. The regions of reception analyzed on the normal propagation by F2 and Es layer reflections, nd graphically represented, are divided into two regions. Region I corresponds to the region n which the satellite is in flight lower than the height of points of maximum electron density in he F2 layer, and region II corresponds to the other region in which the satellite is in flight higher han the height of points of maximum electron density in the F2 layer. An analysis of both regions s presented. *Subject Headings:* **1. Satellite radio signals 2. Ionospheric radio wave propagation.** —*I.S.*

11E–161 551.510.535:621.396.81

Venkateswarlu, P. and Satyanarayana, R. (*both, Physics Dept., Sri Venkateswara Univ., Tirupati*), **Fading of radio waves.** *Current Science*, Bangalore, 27(8):296, Aug. 1958. fig., 2 refs., eqs. **DWB, DLC**—A study of the fading of radio waves has been conducted in the Ionospheric Laboratories of the Physics Department of Sri Venkateswara University, Tirupati. Medium wave radio transmissions were observed from Madras (distance—110 km), Tiruchirapalli (distance—320 km) and Delhi (distance—1700 km). Observations were made by using a specially designed sensitive R-F amplifier-detector unit. Details of the work are included in this note. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Radio fading.**—*N.N.*

11E–162 551.510.535:621.396.1

Vickers, M. D. (*DSIR Radio Res. Station, Slough*), **The calculation of the m.u.f. factor for a non-parabolic ionospheric layer.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 17(1/2):34–45, Dec. 1959. 4 figs., 3 tables, 9 refs., 7 eqs. **DWB, DLC**—A method is described for calculating the ray path of a radio wave through the ionosphere as represented by an $N(h)$ profile based on experimental data. A few such paths are calculated and from these m.u.f. factors are obtained. These factors are compared with those which would have been obtained had the existing methods of calculation been used. In most cases the differences are less than 4%. *Subject Headings:* **I. Ionospheric radio wave propagation 2. Maximum usable frequency calculation.**—*Author's abstract.* Ⓢ

11E–163 551.510.535:523.75:621.396.8:551.594.6

Volland, Hans, **Die Frequenzabhängigkeit der Sonneneruptionseffekte im Längstwellengebiet.** [Frequency dependence of solar flare effects in the region of very long waves.] *Archiv der Elektrischen Übertragung*, Stuttgart, 13(10):443–448, Oct. 1959. 11 figs., 7 refs. German and English summaries p. 443. **DLC**—Measurements of field strength of the transmitters GBR (16 kc/s), GBZ (19.6 kc/s) and GIY20 (51.95 kc/s), made in the Heinrich-Hertz-Institut in Berlin-Charlottenburg during solar flares, show positive and negative field anomalies, dependent on frequency, time of day, and year. These are explained as interferences between ground wave and rays reflected from the ionosphere. It is assumed that the height of reflection decreases during a solar flare. The median height of reflection is between 69 and 76 km for 16 kc/s. It decreases down to 12 km during a solar

flare. The same model can explain the change of the frequency spectrum of atmospherics durin solar flare. *Subject Headings:* **1. Radio disturbances 2. Ionospheric radio wave reflection 3. So flare effects on radio propagation 4. Sferics frequency distribution.**—*Author's abstract.* Ⓢ

11E–164 551.510.535:621.39

Wait, James R. and Perry, Loris B. (*Nat. Bur. of Standards, Boulder, Colo.*), **Calculations ionospheric reflection coefficients at very low radio frequencies.** *Journal of Geophysical Resear* Wash., D. C., 62(1):43–56, March **1957.** 7 figs., 9 refs., 12 eqs. **DLC.** Also issued as *U. S. Natio Bureau of Standards, NBS Report,* No. 3588, May 15, **1956. DWB**—A set of calculated curves presented for the reflection coefficients at a sharply bounded homogeneous ionized medium wit superimposed magnetic field. The results are plotted parametrically to permit general compariso with experimental data. Both steady-state and transient cases are considered. *Subject Headi* **1. Ionospheric reflection coefficients.**—*Authors' abstract.*

11E–165 551.510.535:621.396(

† Watt, A. D.; Maxwell, E. L. and Whelan, E. H., **Low-frequency propagation paths in Arc areas.** *U. S. National Bureau of Standards, Journal of Research, Sec. D,* 63(1):99–112, July/A **1959.** 26 figs., 3 tables, 25 refs., 6 eqs. **DLC, DWB**—The very low ground conductivities encou ered in Arctic areas, and the particular ionospheric conditions prevailing at high latitudes, can le to rather unusual radiation and propagation conditions. In order to determine the magnitude these effects, field intensities from transmitters located in the Labrador and Greenland areas w measured both on the surface of the earth and during several aircraft flights over this area. T many factors involved in LF propagation are considered and calculated field intensities compa with experimental values. Under conditions where the initial portion of the propagation path across icecap or permafrost, the attenuation observed is very great, and when the propagation pa extends out over sea water, the field intensity recovery taking place after the coastline is crosse very marked. Estimates of skywave field intensity appear to agree with the observed resu provided the radiated field pattern is suitably modified by the antenna cutback factor which accou for the presence of a finitely conducting curved earth. These vertical patterns based on work Wait, along with the field intensity flight data, indicate that the siting of low-frequency statio several miles or more inland in Arctic regions may cause a great increase in total transmission pa loss. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Arctic radio wave propagati 3. Arctic.**—*Authors' abstract.* Ⓢ

11E–166 551.510.535:621.39

Wheelon, Albert D. (*Ramo-Wooldridge Corp., Los Angeles, Calif.*), **Radio frequency and scatt ing angle dependence of ionospheric scatter propagation at VHF.** *Journal of Geophysical Resear* Wash., D. C., 62(1):93–112, March **1957.** 8 figs., 20 refs., 4+ eqs. **Discussion** by Ralph Bolgia Jr., *Ibid.,* 62(4):639–640, Dec. **1957.** 11 refs. The weak and fluctuating radio signals observed distances of 1500 km on VHF are attributed to scattering from *E*-region turbulence. It is not that propagation constants $k = 4\pi/\lambda \sin(\theta/2)$, corresponding to the experimental frequencies (28 108 Mc), just straddle the viscosity cutoff wave-number $k_2 = (2 \text{ meters})^{-1}$ of the region, there giving a qualitative explanation for the curious dichotomy found in the experimental data. The t competitive turbulence theories are then developed in detail near the viscosity transition range. is found that pressure fluctuations of the ionosphere's neutral gases induce a spectrum of dielect variations which reproduce the frequency and scattering angle dependence of the experimental resu quite well. A theory of turbulent mixing of ionization gradients is then developed along the lines Heisenberg's original treatment of the velocity field. This process predicts a frequency variati of power levels which is also satisfactory. It is concluded that more precise, simultaneous measu ments will be required to choose between the two theories on this basis. *Subject Headings:* **I. Io spheric radio wave propagation 2. Radio wave scattering.**—*Author's abstract.*

11E–167 551.510.535:621.396

Wheelon, A. D., **Diurnal variations of signal level and scattering heights for VHF propagati** *Journal of Geophysical Research,* Wash., D. C., 62(2):255–266, June **1957.** 6 figs., 16 refs., 4+ e **DLC**—The scattering of VHF radio waves in the lower ionosphere is identified with turbul fluctuations of the electron plasma. The theory of gradient mixing is applied to the afternoon a early evening periods, for which solar control is thought to dominate meteoric contributions. scattering cross-section for this process,

$$\sigma = 2\pi^2 r_0^2 \left(\frac{dN}{dh}\right)^2 \left[\frac{4\pi}{\lambda} \sin\left(\frac{\theta}{2}\right)\right]^{-5}$$

pends on ionospheric conditions only through the ambient electron density-height profile's gradient N'/dh. It is found that the afternoon decay of signal strength and simultaneous increase of scatter- g height can be correlated with independent estimates of electron density and recombination efficients in the lower ionosphere. The observation of two scattering levels on short paths and the ck of a midday maximum on long paths is predictable. Diurnal variations of the frequency pendence of these transmissions suggest a strong influence of the earth's magnetic field. *Subject eadings:* **1. Ionospheric radio wave scattering 2. Ionospheric electron density 3. Ionospheric dio wave propagation.**—*Author's abstract.*

11E–168 551.551:551.510.535:621.396.8

Wheelon, A. D (*Space Technology Labs., Inc., Los Angeles, Calif.*), **Relation of turbulence theory ionospheric scatter propagation experiments (summary only).** *Journal of Geophysical Research,* ash., D. C., 64(12):2230–2231, Dec. **1959.** ref., eq. **DLC**—The subjects discussed are: 1) sta- tical behavior of ionospheric scatter signals; 2) scattering of electromagnetic waves by turbulent regularities; 3) spectrum of electron density deviations and its relation to turbulence; 4) signal vel and scattering heights, and finally, 5) an explanation is given of some SID features in terms of creased attenuation. *Subject Headings:* **1. Ionospheric scatter propagation 2. Turbulence effects radio propagation.**—*W.N.* Ⓢ

11E–169 621.396.67:551.510.62:551.510.535

Wilson, A. C. and Cottony, H. V., **High gain, low side-lobe VHF antenna for ionospheric scatter mmunication.** *U. S. National Bureau of Standards, NBS Report,* No. 6022, Dec. 1, **1958.** 7 p. figs. (incl. photos), table, 8 refs. **DWB**—A corner-reflector antenna having a width of ten wave- ngths and the length of reflecting surfaces of two wavelengths was constructed, adjusted, and tested. he driven element was a collinear array of ten half-wave dipoles. Dolph-Chebyshev current stribution designed for side lobe suppressions to −45 decibels was computed. The currents in the poles were adjusted as nearly as possible to this distribution. The radiation patterns were meas- ed and found to be quite close to the computed. A half-power beamwidth of 9 degrees and −40 db eamwidth of 28 degrees was obtained. The gain was found to be approximately 21 decibels. It as further found that the performance was stable with time and changing weather conditions. *ubject Headings:* **1. VHF antennas 2. Ionospheric scatter propagation.**—*Authors' abstract.*

11E–170 551.510.535:621.396.8

Yabroff, Irving W. (*Stanford Univ., Stanford, Calif.*), **Reflection at a sharply-bounded ionosphere.** *nstitute of Radio Engineers, N. Y., Proceedings,* 45(6):750–753, June **1957.** 6 figs., 7 refs., eqs **LC**—A quantitative description of the waves transmitted into and reflected from a sharply-bounded, nisotropic ionosphere with losses is given. Given curves show the effects of the earth's field and sses for a particular model of the nighttime E layer at vlf. *Subject Headings:* **1. Ionospheric radio ave reflection 2. VLF propagation.**—*Author's abstract.*

11E–171 551.510.62:621.396.81:551.594.5

Yeh, K. C., **Fading and attenuation of high-frequency radio waves over a long path crossing the uroral zone.** Stanford Univ. Radio Propagation Lab., Stanford, Calif., Contract AF 19(604)- 830, Scientific Report No. 2, July 28, **1958.** 72 p. 23 figs., 2 tables, 39 refs., eqs. **DWB**(M(051) 785s)—This investigation is concerned with the fading and attenuation of high frequency radio gnals propagated over a long path crossing the auroral zone. The fading of high frequency signals ropagated over non-auroral paths of comparable length has also been studied, and some new results re presented. The theory of radio wave fading and the methods of analyzing fading records are utlined and discussed. The presence of irregularities in the ionosphere introduces signal amplitude ariations which are, in general, functions of time, space coordinates, and the radio frequency. A neory of selective fading is developed in terms of diffraction from an assumed one-dimensional creen of random irregularities. Dependence of selective fading on the angular power spectrum defined as the power in a differential angular range) and the "size" of the irregularities is studied. vidence is presented to show that signals reflected from auroral ionization have relatively high ading speeds. In addition, the frequency interval over which this fading is correlated is relatively mall. The principal fading and attenuation measurements on which these conclusions are based ere carried out in August, 1957. Results are grouped in accordance with the propagation path nvolved: auroral, temperate latitude, and transequatorial. Special emphasis has been placed on ne measurements of auroral paths. For this situation, there is no diurnal variation in fading speed xcept for a distinct minimum in the time interval 1300–1900 PST, during which the fading speed as no apparent dependence on magnetic activity along the path. In other periods a positive orrelation between fading speed and magnetic activity is found. It is suggested that the afternoon inimum in fading speed is a consequence of the existence at that time of the kind of propagation

mode made possible by ionospheric tilts. Attenuation over the long auroral-zone path is found to associated with "blackouts" as indicated by the absence of returned echo in vertical sounders locat along the path. The percent association varies with the location of the station relative to the pat and the time of day. This is explained on the basis of certain assumed propagation modes. positive correlation of auroral attenuation with magnetic activity is found for all the periods of t day. Similar observations for temperate-latitude and transequatorial paths of comparable leng indicate that there is strong diurnal variation in fading speed. Some plausible explanations a offered. In addition, a remarkable regular fading was observed at times on transmissions from t BBC relay station at Singapore. It is believed to have a Doppler origin and is tentatively nam "Doppler" fading. *Subject Headings:* **1. Radio fading 2. Radio reflection from auroras 3. Rad wave attenuation 4. Polar blackouts.**—*Author's summary.*

11E–172 551.510.535:551.594.13:621.39

Zhekulin, L. A., **Raspredelenie elektronnoĭ kontsentratsii s vysotoĭ po dannym opytov s raketa i iskusstvennymi sputnikami Zemli i ee vliianie na rasprostranenie radiovoln.** [Distribution electron density with height according to data from rocket and artificial satellite experiments and effect on radio wave propagation.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 1:67–79, 195 5 figs., 7 refs., 27 eqs. **DLC.** Transl. into English issued in **Artificial Earth Satellites**, issu N. Y., Plenum Press; London, Chapman and Hall, **1960.** Vol. 1: 85–101.—With the aid of releva equations, the author presents a comprehensive examination of the propagation of radio waves at hi altitudes. The contents of this paper include the following, viz: distribution of the density of ioniz tion with height; effect of the distribution of ionization, as disclosed by the most recent experimen upon the propagation of radio waves; extinction of radio waves; and unstable processes in the refle tion of an electromagnetic signal from a non-homogeneously ionized layer. The solution of t problem of the propagation of electromagnetic waves in the ionosphere with the distribution of io zation is expressed in Airy functions. A sharp variation of the ionization gradient occurs in the layer of the ionosphere since the continuous and approximately monotonic increase of ionization wi height is maintained. Hence, with increase in the frequency, the level of reflection of electroma netic waves is displaced gradually into higher regions of the ionosphere. The critical frequency I is that at which the dielectric penetrability for the ionization density N_1, corresponding to the lev of the sharp ionization gradient becomes zero. The effective height of the ionosphere increas sharply in the transition through W_0 and the extinction of waves increases at the same time, since t intensity of the incoming signal is slight. The curves of the establishment of signals reflected fro the E and F regions with distributions of ionization correspond to the most recent experimental dat *Subject Headings:* **1. Ionospheric electron density distribution 2. Ionospheric radio wave propag tion.**—*I.L.D.*

PART III. TRANSLATIONS, RECENT MONOGRAPHS, AND ANALYTICS FROM SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted. The item number is mentioned for those titles which have been abstracted in previous issues of **Meteorological and Geoastrophysical Abstracts.**

A. TRANSLATIONS

erniavskiĭ, E. A.: **The earth's surface charge.** (Transl. of original Russian, **K voprosu o zariade poverkhnosti zemli,** in *Akademiia Nauk SSSR, Izvestiia, Ser. Geog. i Geofizich.*, 12(2):169–176, 1948) Transl. by Michael M. Dane and David Kraus, issued by American Meteorological Society under Contract AF 19(604)-1936, Oct. 1955.

irvinskiĭ, P. N.: **First observers of ball lightning.** (Transl. of original Russian, **Pervye nabliudateli sharovykh molniĭ,** in *Priroda*, Moscow, 43(8):116, Aug. 1954) Transl. by Marcel I. Weinreich, issued by Sandia Corporation, Albuquerque, N. M. as its SCL-T-233, 1959. Available DWB (M94.223 C541fi) (*For abstract on original Russian, see* 6.7–75, July 1955, *MAB*)

nkelacker, Otto: **Concerning special wind distribution functions.** (Transl. of original German, **Über spezielle Windverteilungsfunktionen** in *Wetter und Klima*, 2(5/6):129–138, May/June 1949. fig., tables, eqs.) Transl. issued by Sandia Corporation, Albuquerque, N. M. Available DWB (M52 D5844co) (*See* 4-95, April 1950, *MAB*)

ptarev, N. P.: **On certain characteristics of wind gustiness.** (Transl. of original Russian, **O nekotorykh kharakteristikakh poryvistosti vetra** in *Meteorologiia i Gidrologiia*, Leningrad, No. 5:45–49, May 1957) Transl. (13 p.) issued Wright Patterson Air Force Base, 1959. Available DWB (M51 G659on) (*See* 10.4–228, April 1959, *MAB*)

ri, Takeo: **On the supercooling and evaporation of thin water films, Pt. 1.** (Transl. of original Japanese from *Low Temperature Science, Series A, Physical Sciences*, 15:34–52, 1957) Transl. (8 p.) by Charles A. Meyer and Co., Inc., issued as *U. S. Snow Ice and Permafrost Research Establishment, Translation* No. 62, Feb. 1960.

linker, L.: **Further results of tropospheric drift observations with regard to the question of the mechanism of long range propagation at meter wavelengths.** (Transl. of the original German, **Weitere Ergebnisse von troposphärischen Driftbeobachtungen zur Frage des Fernausbreitungsmechanismus im Meterwellenbereich** in *Zeitschrift für Meteorologie*, Berlin, 11(10/11):339–344, 1957) Transl. into English issued as *American Meteorological Society, Translation* T-G-156+ (13 p.) (*See* 10.4–164, April 1959, *MAB*)

ppo, S. D.: **Let's do a better job of ice-forecasting.** (Transl. of original Russian in *Sovetskaia Arktika*, No. 2:48–57, 1938) Transl. by E. R. Hope issued as *Canada. Defence Research Board, Translation* T.15.R.

aksimov, I. V.: **Eighty-year cycle of terrestrial climatic fluctuations.** (Transl. of original Russian in *Akademiia Nauk SSSR, Doklady*, 86(5):917–920, 1952) Transl. by E. R. Hope issued as *Canada. Defence Research Board, Translation* T.81.R. (*See* 4.6–203, June 1953, *MAB*)

etrianov, I. and Rozenblium, N.: **On the contact-angles of small droplets.** (Transl. of original Russian in *Akademiia Nauk SSSR, Doklady*, 61(4):661–664, 1948). Transl. by E. R. Hope issued as *Canada. Defence Research Board, Translation* T.23.R.

rymsakov, T. A.: **Nature of the Southwest Asia low-pressure region.** (Transl. of original Russian in *Akademiia Nauk SSSR, Doklady*, 73(2):291–294, 1960) Transl. by E. R. Hope issued as *Canada. Defence Research Board, Translation* T.64.R.

tokman, V. B.: **Relationship between the wind-field, the transport-field and the mean mass-field in a non-homogeneous ocean.** (Transl. of original Russian, **Sootnosheniia mezhdu polem vetra, polem polnykh potokov i srednim polem mass v neodnorodnom okeane** in *Akademiia Nauk SSSR, Doklady*, 59(4):675–678, 1948) Transl. by E. R. Hope issued as *Canada. Defence Research Board, Translation* T.56.R. (*See* 6.11–269, Nov. 1955, *MAB*)

B. RECENT MONOGRAPHS

Abbot, Charles Greeley: **Long-range forecast of United States precipitation.** *Smithsonian Miscellaneous Collections*, Vol. 139, No. 9, 1960. 78 p. figs., tables. DLC

Adams, C. C.: **Space flight: satellites, space ships, space stations and space travel explained.** London, McGraw-Hill, 1958. 224 p.

Bagdasarian, A. B.: **Klimat Armianskoĭ SSR** [Climate of Armenia]. Erevan, Akademiia Nauk Armianskoĭ SSR, 1958. 139 p. figs., tables, refs. DLC (QC989.R5A7)

Bauer, P. P.: **Waldbau in Südchile** [Forestation in South Chile]. *Bonner Geographische Abhandlungen*, No. 23, 1958. 120 p. DLC (G58.B6)

Behr, Karin: **Über markante Erwärmungen in der Stratosphäre: Entdeckung, Beispiele, Theorie** [Marked warming up of the stratosphere: detection, examples and theories]. *Berlin Freie Universität. Institut für Meteorologie und Geophysik, Meteorologische Abhandlungen*, Vol. 1, No. 2, 1960. 57 p. figs., tables, numerous refs. DWB

Bharucha, F. R. and Shanbhag, G. Y.: **Precipitation effectiveness in relation to the vegetation of India, Pakistan and Burma.** *Bombay. Univ., Botanical Memoirs*, No. 3, 1957. 109 p. tables, 7 figs. Price Rs 1.50. Review by A. K. Mallik in *Indian Journal of Meteorology and Geophysics*, 9(3):296, July 1958.

Bowditch, Nathaniel: **American practical navigator: an epitome of navigation originally written by Nathaniel Bowditch.** Wash., D. C., U. S. Navy Hydrographic Office, 1958. 1524 p. illus. Price $6.25. Review by C. E. N. Frankcom in *Marine Observer*, 30(188):100–102, April 1960.

Campbell, Ethel M.: **The wind: nature's great voice.** Illus. by Norma Stevens. Minneapolis, T. S. Denison, 1959. 45 p. Price $3.00. DWB

Fedorov, Evgeniĭ Konstantinovich: **Fizicheskie metody vozdeĭstviia na pogodu** [Physical methods of weather control]. Moscow, Znanie, 1959. 21 p. DLC (AS262.V833, Ser. 9, No. 20, 1959)

Foitzik, Leonhard and Hinzpeter, H.: **Sonnenstrahlung und Lufttrübung** [Solar radiation and atmospheric turbidity]. Leipzig, Geest & Portig, 1958. (*Probleme der Kosmischen Physik*, Vol. 31) 309 p. 80 figs. Price DM 43—. Review by F. Lauscher in *Wetter und Leben*, 10(8/10):149, 1958.

Fowler, John M. (ed.): **Fallout: a study of superbombs, strontium 90 and survival.** N. Y., Basic Books, Inc., 1960. 235 p. figs., tables. DLC (QH652.F6)

Fritz, A.: **Start in die dritte Dimension** [Start in the third dimension]. Stuttgart, Herold, 1959. 224 p.

Great Britain. Meteorological Office: **Aviation meteorology of the West Indies.** Its *Meteorological Report*, Vol. 3, No. 22, 1959. 85 p. figs., tables, refs. DWB

Hoffmeister, Cuno: **Messungen der atmosphärischen Optik in Süd-Afrika** [Measurements of atmospheric optics in South Africa]. Berlin, Akademie-Verlag, 1957. 246 p. 20 figs., 20 tables. Price DM 36. (*Sonneberg. Sternwarte, Veröffentlichungen*, Vol. 3, No. 2) Review by H. Hinzpeter in *Zeitschrift f. Meteorologie*, 11(8):251, Aug. 1957.

Iliopoulos, P. J.: **Le climat de la région égéene de la Grèce** [Climate of the Aegean region of Greece]. Athens, 1952. 75 p. illus. (*Collection de l'Institut Français d'Athènes*, 75).

Kopcewicz, Teodor: **Fizyka atmosfery** [Physics of the atmosphere]. Warsaw, Pánstwowe Wydawnictwo Naukowe, 195–. illus. DLC (QC880.K66)

Muromtsev, A. M.: **Osnovnye cherty gidrologii Indiĭskogo okeana** [Basic hydrological features of the Indian Ocean]. Leningrad, Gidrometeoizdat, 1959. 437 p. figs., table, refs. A Supplement No. 2, **Atlas vertikal'nykh razrezov i kart temperatury, solenosti, plotnosti i soderzheniia kisloroda** [Vertical profile atlas and charts of temperature, salinity, density and percentage of oxygen]. 160 charts. DWB

Reiter, Reinhold: **Meteorobiologie und Elektrizität der Atmosphäre** [Meteorobiology and atmospheric electricity]. Leipzig, Geest & Portig, 1960. 424 p. figs., tables, bibliog. (*Probleme der Bioklimatologie*, Vol. 6)

Sauberer, Franz and Härtel, Otto: **Pflanze und Strahlung** [Plants and radiation]. Leipzig, Akademische Verlagsgesellschaft, 1959. 268 p. 82 figs., 99 tables. Price DM 29.50 (*Probleme der Bioklimatologie*, Vol. 5) Review by F. Schnelle in *WMO Bulletin*, 9(2):120, April 1960.

Siple, Paul Allman: **90° south: the story of the American South Pole conquest.** N. Y., Putnam, 1959. 384 p. figs., photos. DWB

Smith, C. V.: **Synoptic evolution of 500-millibar flow patterns: a medium-range forecasting** *Great Britain. Meteorological Office, Meteorological Reports*, Vol. 3, No. 21, 1959. 67 p. figs., table, refs. DWB

South Africa. Council for Scientific and Industrial Research: **Symposium on design for tropical living.** Prepared by National Building Research Institute of the Council. Pretoria, 1959. 222 p.

efens, N. B.; Horman. M. H. and Dodd, E. E.: **The determination of atmospheric transmissivity by backscatter from a pulsed-light system.** Riverside, California, Motorola Inc., Riverside Research Laboratory, 1957. 131 p. 43 figs. Review by L. Foitzik in *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(1/2):128, 1959.

ružka, Vladimír: **Meteorologické přístroje a měření v přírodě.** Prague, Statní Pedagogické Nakl., 1956. 519 p. illus., refs. DLC (QC871.S85)

S. Dept. of the Army: **Meteorology for Army aviation.** Its *Technical Manual*, TM 1-300, 1958. 118 p. illus., maps, diagrs. DLC (U408.3.A13)

C. ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

belson, Philip Hauge (ed.), Researches in Geochemistry. N. Y., Wiley; London, Chapman & Hall, 1959

Garrels, Robert M.: **Rates of geochemical reactions at low temperatures,** p. 25–37
Libby, W. F.: **Tritium in hydrology and meteorology,** p. 151–168
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China. Central Weather Bureau. Agrometeorological Laboratory: **Vopros o sostavlenii prognozov sroka poseva khlopchatnika,** [Problem of forecasting the date of cotton sowing], p. 1–9

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kademiia Nauk SSSR, Izvestiia, Ser. Geofiz., No. 11, Nov. 1959

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Soderzhanie zhurnala "Izvestiia AN SSSR, seriia geofizicheskaia" za 1959 g, [Contents of the journal Izvestiia AN SSSR, Ser. Geofiz. for 1959], p. 1904–1911

American Geophysical Union, Transactions, Vol. 41, No. 1, March 1960

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IGY Bulletin No. 33, March 1960, p. 107–122 (*For titles in this section, see below under* **IGY Bulletin**)

American Meteorological Society, Bulletin, Vol. 41, No. 3, March 1960

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erlin. Freie Universität. Institut f. Meteorologie und Geophysik, Meteorologische Abhandlungen, Vol. 9, No. 1, 1960 (UNESCO/WMO Seminar on Mediterranean Synoptic Meteorology, Rome, Nov. 24–Dec. 13, 1958 Report, Lectures [etc.] Ed. by W. Bleeker.)

Bleeker, W.: **Report on the UNESCO/WMO Seminar on Mediterranean synoptic meteorology, Rome, Nov. 24–Dec. 13, 1958,** p. 3–9
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emel en Dampkring, The Hague, Vol. 57, No. 12, Dec. 1959

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GY Bulletin, No. 31, Jan. 1960 (This **Bulletin,** issued by the National Academy of Sciences, appears as a section of the **American Geophysical Union, Transactions,** 41(1):75–90, March 1960)

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Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere and Spa Research in Japan, Vol. 13, No. 2, 1959

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Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy, No. 101, 1959

D'iachenko, P. V.: **Opyt primeneniia metodov matematicheskoĭ statistiki k izucheniiu mikro struktury tumanov i oblakov,** [Attempt at using the method of mathematical statistic for the study of the microstructure], p. 3–50
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eteorologické Zprávy, Prague, Vol. 12, No. 5, 195

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oyal Society of London, Proceedings, Ser. A, Vol. 253, No. 1275, Dec. 29, 1959 (Entire issue devoted to discussion on space research, under the leadership of H. S. W. Massey, Nov. 12–13, 1958)

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